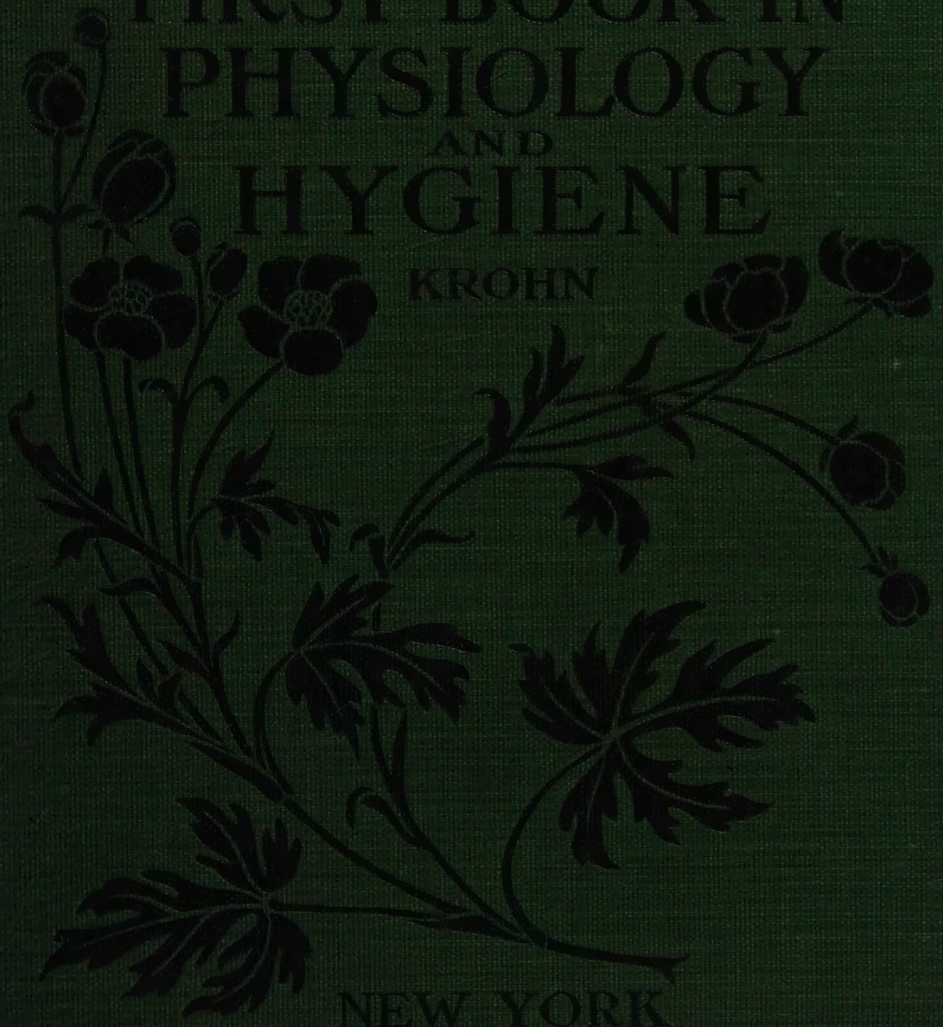
FIRST BOOK IN PHYSIOLOGY AND HYGIENE

KROHN



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BRANCH NORMAL

FIRST BOOK

IN

PHYSIOLOGY AND HYGIENE

BY

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PREFACE.

In these lessons for young children simple language is used in the presentation of such facts about the structure of the body and its functions as are necessary for clear and definite knowledge of the general laws of health, including the effects of alcohol and narcotics.

This book is for the use of pupils just beginning to learn something of the care the human body requires in order to insure the full enjoyment of health. The value of a primary book upon any subject depends both upon the language used and the varied forms of appeal to the child's mind, in order that his interest may be aroused. In this book there are few complex sentences. There is, also, such frequent alternation in story, written exercise, and observation, picture, memory, and reading lessons that the subject-matter cannot become trite. The lessons are so logically arranged, and so pedagogically co-ordinated, that every sentence, every question, every picture, every poem, every written exercise, forms a vital part in the presentation of hygienic law as an educational whole, in a form most readily comprehended by the child.

Anatomy, strictly speaking, is a science the study of which requires the more mature mind of the advanced high-school or college student. Only such basal facts of the

body's structure are here presented as are necessary for a clear understanding of the laws of health.

TO THE TEACHER.

Lead the pupil not only to see what is healthful, but to practice it. A helpful aid is the organization of your pupils into a Good Health Club, with constitution and by-laws, and a full complement of officers. Once each week the Club should convene, in lieu of the regular recitation, to discuss and formulate rules based upon the lessons immediately preceding. These rules are then to be voted upon and adopted by the members of the Club. The rules should be somewhat after the manner of the suggested rules on pages 55 and 66.

Lay tribute to everything available in literature, art, or song that will add to the attractiveness and usefulness of your instruction in this important subject. Adorn the school-rooms with copies of old masterpieces that will lead the pupils to admire the power, dignity, grace, and beauty of a healthy body. Give descriptions of the simple habits and love of exercise of the ancient Greeks. Tell them of the careful training of the modern athlete. Make use of the gymnastic games given in such books as that by Miss Pray, or the one by Miss Stoneroad (both published by D. C. Heath & Co.). In discussing the blessings of sunshine, read such poems as Whittier's "Sunset on the Bear Camp," or others by Longfellow and Bryant. Southey's "Cataract of Ladore," Shelley's "The Clouds," or Tennyson's "Brook"

will serve a similar purpose in the discussion of water and its necessity to life.

In preparing to present the lessons of this book, the teacher may find it of advantage to make occasional reference to the author's larger work, "Graded Lessons in Physiology and Hygiene."

The teaching of temperance requires the greatest tact in order to attain the utmost usefulness. Children imitate those they love and in whom they have confidence. Your own personal attitude against the use of alcoholic drinks and tobacco is perhaps the most potent factor in temperance instruction. As a rule, it is better to emphasize what to do rather than what not to do. Children are more benefited by positive than by negative forms of instruction. Lay more and more stress upon the joy of possessing a body strong in limb, rich in clean blood, steady in nerve, clear in brain, needing no stimulant other than pure air, wholesome food, regular exercise, and invigorating sunshine.

In teaching the subject of physiology and hygiene, as in any of the other of your many endeavors, strive to awaken a desire in the child to live the best life possible. To live successfully, he must have a sound mind in a sound body. By keeping his health, he will be able to make his every effort count at par. As a result of ill health, which comes because of disregarding hygienic law, his every effort will be discounted.

William O. Krohn.

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MILLET.

FEEDING HER BIRDS.

I.—WHY WE EAT.

A Wonderful Machine.—You have all seen an automobile whizzing down the road. Nothing was pulling or pushing it. It seemed to be going of itself. The man seated in it was only guiding it. But, as it passed, perhaps you smelled the odor of

the gasoline. This gasoline was the fuel that was used to move the automobile.

Perhaps you have seen an automobile standing still on a country road, while the owner waited for a team to come along to pull his machine for

him. He had been running it a long time, and had used all his gasoline.

Have you ever thought that your body is a machine far more wonderful than the automobile? The machinery of your body would stop working if you did not give it fuel; so at least three times every day you feed it something to keep its parts working, and to keep it alive.

Sometimes an automobile breaks down. All the time that a machine is going, its parts are getting more and more worn. One of the parts may become so worn that it breaks; and then the machine cannot go again until it has been repaired.

The parts of your body become worn, too; but they are able to repair themselves. And they are doing this just as fast as they are wearing away.

What the Body Can Do.—All the parts of your body are working together to keep you alive and to give you strength to think and move.

You may use your body till you tire it, but it soon becomes rested again. You may cut or bruise it, but the cut or bruise soon heals. Your body is therefore mending, or repairing, itself.

There is something else that your body can do that the automobile cannot. You never saw a small automobile grow into a big one, no matter

how much gasoline was fed to it. But perhaps you have noticed a baby grow. You know how tiny and weak he was six months ago. He could not sit up alone or even hold a plaything; he could not understand you when you spoke. Now he is a big baby. He stretches out his hands for his toys, and even creeps about the floor; and some of the things you say to him he can understand. Both his body and his mind have been growing. What makes the baby grow?

The plants in your garden or your window boxes are growing, too. They are growing taller; they are putting out new leaves and blossoms. What makes these plants grow? You give them water, and you know that their roots are getting food from the soil around them. If they were not planted in earth, and watered, they would stop growing, wither, and die. But the green leaves and the bright blossoms do not look as if they were made out of earth and water, do they? The baby's plump little body does not look like the milk he drinks. Yet it is the food the baby takes that makes him grow.

Why We Eat.—Now we know three reasons why we eat: to keep the machinery of our bodies running; to keep our bodies repaired; to make them

grow. What we eat gives us strength, or power, to think and move; it builds us up as fast as we wear out, so that we can keep well and strong; it makes us grow taller and larger; it makes us able to understand more and to do more.

But eating will not do these things for us unless we eat the right kinds of food at the right times. In eating, we chew our food and swallow it. In the stomach and other parts of the body it is softened still more, and changed, until it goes into the blood and becomes part of the body itself. This work that the body does in making the food ready to use, we call *digestion*.

Unless the body can digest its food well, it will not be strong and will not grow.

Caring for the Body.—Like plants, our bodies need more than food. They must have air and sunshine, too. And they must have care—even more care than a gardener gives his plants. How do food and air and sunshine, and our own care, keep us healthy and strong and growing? That is what we shall learn.

When we are learning how the different parts of our bodies work, we are studying *Physiology*. When we are learning how to take care of our bodies, we are studying *Hygiene*.

II.—PLANTED HIMSELF TO GROW.

A MEMORY LESSON.

Dear little bright-eyed Willie,
  Always so full of glee,
Always so very mischievous,
  The pride of our home is he.

One bright summer day we found him
  Close by the garden wall,
Standing so grave and dignified
  Beside a sunflower tall.

His tiny feet he had covered
  With the moist and cooling sand;
The stalk of the great, tall sunflower
  He grasped with his chubby hand.

When he saw us standing near him,
  Gazing so wonderingly
At his babyship, he greeted us
  With a merry shout of glee.

We asked our darling what pleased him;
  He replied with face aglow,
"Mamma, I'm going to be a man;
  I've planted myself to grow."

—*Selected.*

III.—WHAT TO EAT.

The Lands of Cake and Candy.—Perhaps some of you have read a story that Louisa Alcott wrote about a little girl who was very fond of sweets. She wished that she might eat all the cake and candy she wanted, and that she need eat nothing else.

Once in her dreams she was taken to a land of little people, where everything, even the little people themselves, was made of candy. The little girl was delighted, and began to eat all the candy she wanted. It was not long, however, before she felt herself growing very cross. How tiresome all this candy was! If she could only find something else to eat! Then she decided to run away from Candy Land.

A great desert of brown sugar lay beyond, but she hurried over it as fast as she could. Soon she came to a country where everything was cake. What beautiful fruit cakes and frosted cakes! But, after all, the cookies were better, and the gingerbread was better still. And how good a slice of plain bread would taste, if one could only find it. It

was really vexing to find nothing that was not sweet. Here in the Cake Country the little cake people themselves were not satisfied. They were all waiting to be promoted to the Land of Bread. As that was just where the little girl herself longed to go, she asked how to get there; and once more she ran on.

The way lay between fields of waving grain and by a river of milk, and soon she smelled the delicious odor of fresh bread. Shall we finish the story? Or can you guess why it was that this little girl, who had once been fretful and sickly, grew to be a strong, happy woman?

If you had been the little girl in the story, would you have longed to reach the Land of Bread? Why? The candy and the cake would not have given your body the materials it needed most; so your body would have hungered for something better. Foods like bread, which we often call "plain foods," are much more useful to our bodies than are very sweet foods. So the plain foods always taste good, but we should very soon tire of cake and candy.

Sweet foods are not harmful, if we do not eat too much of them; for we need some sugar. But sweet foods alone cannot make us grow; they can-

not make us strong; they cannot keep us well. They are not nearly so good for us as milk, meat, oatmeal, or potatoes. Some of the things that go into rich candy and cake are not useful at all. They only load our stomachs and make trouble for them. If we eat candy or cake between meals, we fill our stomachs so that we do not feel hungry when we come to the table. But our bodies will not have had the kind of food that they need to keep them in order. Then we become ill.

Why We Eat Different Kinds of Food.—Do you think that the little girl in the story would have liked to live long in the Land of Bread? Suppose you had all the bread you wanted to eat, but only bread—bread to-day, bread to-morrow, bread the next day, and nothing but bread for a month. At the end of the month, what would you say? "Oh, I do wish I could have some meat and potato. I am so tired of bread." You would have grown tired of tasting just this one thing over and over. But if you had a great many different things to taste, you would not grow tired of any one. Then you would enjoy eating and would eat enough. You would keep an *appetite*, or desire for food.

However, there is a much more important reason why we should have different kinds of food.

Some foods are better mending material than others, and make us grow faster; some give us more force and strength. Our bodies need them all. Milk does more for us than any other one food we take. But milk alone does not do enough. Our bodies need other materials. They can get one kind from meat, another from butter, and still another from potato. Our bodies are hungry for these different materials. In fact, we must have different foods, or we cannot keep well and grow strong.

Though we may like some foods better than others, we can easily learn to like most of those that are good for us. We ought to try to like many kinds, so that our bodies can get all the different kinds of material they need. If children refuse good food, their bodies will punish them for it; for they will not grow tall or plump or rosy, and they may become ill.

IV.—KINDS OF FOOD.

Food for Warmth.—Surely, many a winter day when you have come home from school, you have said to your mother, as you stamped the snow from your feet and swung your arms, "Oh, I am so cold!" And your mother has said, "Never mind, come and eat your dinner, and that will make you warm." It is true, the dinner was hot. But dinner does not stay hot very long on the table, even when it is covered. Then could your dinner keep you warm? Just as soon as dinner was over, you went out again and played in the snow; but you did not mind the cold at all. You felt much warmer than when you were walking home hungry. Your dinner was being digested; and this work that your body was doing inside itself was making your blood flow faster, and making you feel warmer.

In cold weather we must eat enough to keep the blood flowing briskly, or the cold air will chill the body, and we shall become ill. Some kinds of food make us feel warmer than other kinds do. Meat and fatty or oily foods warm us more than do fruit and such light, juicy foods. So in winter we

eat more of the hearty foods; and in summer we eat more of the light, watery foods.

The Eskimo in the far North wears thick furs all the time, but he could not live if he did not eat a great deal of very fat food to keep him warm. An Eskimo would rather eat a dozen tallow candles than a dozen juicy oranges.

The blood in the body is always warm, whether the skin feels cool or not. The food that you eat finds its way into your blood. What you ate yesterday is still being used. This food in your blood is changing in a way that is a kind of burning, and this burning of the food keeps the blood warm. If one's blood is not about 98.4 degrees Fahrenheit, he is not well.

Food to Suit Our Occupations.—Our occupations, as well as the climate in which we live, make a difference in the kind of food we eat. An active man needs more food than an idle man does. The lumberman cutting down trees in the winter woods and piling up the logs requires heartier food and more of it than the man who sits quietly at his desk. If you are playing out of doors, or working with tools, you grow hungry sooner than when sitting still in the house. Boys are usually more active than girls, and eat more. And boys and girls both

eat more while they are growing than they do after they have reached their full size.

Food for Different Times of Day.—When we are asleep, the whole body is resting. It cannot digest food so easily then as it can while we are awake. So we should not eat heartily just before going to bed. If we do eat a hearty meal at night, we ought to stay awake for at least an hour afterward to give the stomach a chance to take care of the food.

It is much better for you to eat most of your solid food, such as meat and vegetables, and the sweet foods—of which, however, one should not eat much at any time—in the middle of the day. If you have been wide awake and busy all the morning, your body needs these foods, and you are hungry for them. Then, too, your stomach is able to digest them.

Overeating. — You know the old saying, "Enough is as good as a feast." Your stomach would say, "Enough is better than a feast."

The stomach does not like to be overworked. It is so easy for a person to eat more than he needs. But one should think ahead in eating, just as much as in the other things he does. If you want to eat a little dessert, do not keep on eating meat and

potato until you "can't eat another mouthful" and then try to cram down the dessert on top of that. If you know that dessert is coming, leave room for it. Never ask for more of anything, no matter how good it tastes, if you feel that you have already stopped your hunger.

The stomach is small, and can take in only just so much at a time. Why should you strain it and tire it with food that you do not need? It may do more harm to the body to overeat than not to eat enough.

The Three Kingdoms.—We have been thinking of foods according to what they do for us—whether they keep us warm, or build up the worn parts of the body, or are easily digested. Often we group foods in another way. We think of the sources from which we get them.

Suppose that you had for breakfast, an orange, some oatmeal, a soft-boiled egg, a cornmeal muffin, and a glass of milk. Where did these foods come from? Of course, you will say that the orange grew on a tree; that the oatmeal was ground out of oats, and the cornmeal out of corn; that the egg was laid by a hen; and that the milk came from a cow. But in the muffins were sugar, which was made from the sugar-cane plant; and some wheat

flour and some baking powder and salt and butter and egg. Salt had been put with the oatmeal when it was cooked; and you ate salt and pepper, and perhaps a little butter, with your egg. The salt had been dug out of the earth. That was a mineral food. Which of all these foods came from animals? Which from plants?

There are three classes of foods—*mineral, animal,* and *vegetable.* We call these three classes the *three kingdoms.*

V.—WINTER APPLES.

A MEMORY LESSON.

What cheer is there that is half so good
  In the snowy waste of a winter night,
As a dancing fire of hickory wood
  And an easy-chair in its mellow light,
    And a pearmain apple, ruddy and sleek,
    Or a jenneting with a freckled cheek?

A russet apple is fair to view,
  With a tanny tint like an autumn leaf,
The warmth of a ripen'd corn-field's hue
  Or golden hint of a harvest sheaf;
    And the wholesome breath of the finished year
    Is held in a winesap's blooming sphere.

—*Hattie Whitney.*

VI.—MINERAL FOODS.

Salt.—Salt is the chief food that we get from the mineral kingdom. There is salt in every part of the body, except in the hard shiny surface of the teeth. We must keep our bodies supplied with salt for all these parts, so we eat it often.

Nearly all foods contain a little salt. But the salt in raw foods is not enough; so we add more salt in cooking, or at the table.

Eating salt food "makes the mouth water." This liquid in the mouth softens the food and makes it easier for the stomach to use.

All animals need salt. Most four-legged animals like to eat salt-marsh grass; wild animals, such as deer and bear, will go a long distance to get to a salt spring. The stock farmer who wants his horses or cattle to have good smooth hides, or his sheep to bear thick wool, will feed the animals a great deal of salt.

Can you tell from what parts of our country we get salt, and how it is obtained?

Other Mineral Foods.—Besides salt, our bodies need *lime*, and a very little *soda*, *potash*, and *iron*.

Our bones are more than half *lime*; and there is a small amount of lime in every other part of the body. About all the lime we need is in our food before it is cooked. Growing grass takes from the soil lime and the other minerals that we need. Cows eat the grass, so we get some lime from the milk we drink. Wheat and other grains also take these minerals from the soil. By grinding grain into flour, and eating bread made from the flour, we get more lime. Bread and milk, therefore, are excellent foods for growing boys and girls.

Soda and *potash* help digestion.

Iron is taken from the soil by all green plants; so our bodies get iron by eating green foods, such as spinach, lettuce, and dandelion or beet greens.

VII.—ANIMAL FOODS.

Flesh, such as beef and mutton, turkey and chicken, and fish, we call animal food. To the animal kingdom belong also the foods that living animals give us—milk, butter and cheese (which are made from milk), and eggs.

Milk.—Pure, fresh milk is the only food that contains all the things our bodies need most. What material do you already know that it contains? Of what use to us is that material? The cream in the milk is oily or fat, and such material is good mending food and will keep us warm and make us grow. Milk can keep a man alive longer than can any other one food. Doctors order it more than any other food for people who are sick, because it is so easily digested.

Milk should never be swallowed ice-cold; and milk that is heated, but not boiled, is better for the body than cool milk is.

Fresh milk should be kept covered in a cool, clean place, where the air is pure; for it is quick to absorb the odors that are in bad air, and it sours quickly if the air is warm.

Butter, which is made from the thickest cream of the milk, is a very fat or oily food. Oil is lighter than water; so when milk is allowed to stand, the oily part rises above the watery part. This forms a thick surface of cream, which can be skimmed off and churned into butter.

Butter not only gives a better taste to some other foods, but adds the fat that it is necessary for us to have. Bread and potatoes contain no fat; but, when eaten with butter, they are more nourishing and more digestible.

Cheese contains more food material than most lean meats do; yet it is so solid, or compact, that it is not easily digested. It is a cheap food, and a good one for men who work hard out of doors; but children should eat very little cheese, except "cottage cheese," which is loose and flaky.

Eggs are perhaps the next best food to milk. They are, like most foods, better if eaten soft. The white of the egg is nourishing; but we need the yolk, too, for it contains yellow oil, or fat. Eggs soft-boiled, poached, or scrambled with milk are excellent for us. An omelet is not quite so good. It is fried; and, as you will learn a little later, fried foods are not the best. Eggs that are dropped whole into fat and fried, we should choose last of all.

Meats.—All flesh foods are very strengthening. *Beef* is on the whole the best meat for us. Some of the cheaper beefsteaks, such as round steak, are more nourishing than some that cost more.

Mutton is not quite so strengthening as beef; nor is it so digestible, because it is less soft and juicy. But it comes next to beef as a good meat.

Veal and *pork* are more compact, and make our stomachs work harder to use them. Pork is more nourishing than veal, but only a strong healthy person who works out of doors should eat much veal or pork. From what animal do we get beef? mutton? veal? pork?

Fish is not so strengthening as meat; but it is well to eat fish once or twice a week, if only for variety. It is a dangerous food unless it is quite fresh; for fish spoils quickly, and spoiled food is poisonous. *Salted codfish* costs but little, and is very wholesome and tastes good, if it is well prepared. It is about the best fish food that we can take.

Shell fish, such as oysters and clams, are better raw than cooked. Cooking makes them tougher, and therefore less digestible.

VIII.—A PICTURE LESSON.

Write a story about this picture. Use some of the facts of the preceding lesson.

DUPRÉ.

MILKING TIME.

IX.—VEGETABLE FOODS.

All foods that come from plants are vegetable foods, and we have a greater variety of these than of mineral or animal foods.

Sometimes it is the *fruit* of the plant that we eat; as cucumbers, tomatoes, melons, berries, apples, oranges, pears, bananas, grapes, and nuts.

Sometimes it is the *stem* or the *leaves* of the plant that we eat; as lettuce, spinach, celery, asparagus, cabbage, and dandelion and beet greens.

Sometimes it is the *root* of the plant that we eat; as potatoes, beets, turnips, carrots, onions, and ginger.

Sometimes it is the liquid, or *sap*, inside the plant that makes a good food. It is the sap of the sugar-maple tree that is boiled to make maple syrup and maple sugar. It is the sap of the sugar cane that is boiled to make the sugar that we use every day.

There is one food that bees get from the *flowers* of plants, and that we take from the bees. That is honey.

There is the *bark* of at least one plant of which we eat a little; and that is cinnamon.

Vegetables.—*Potatoes* contain a great deal of starch, and starch is a necessary material for our bodies to have. It gives us power, is a good mending food, and keeps us warm. But potatoes, as we have already learned, make a much better food if they are eaten with butter, or with some other fat food like meat gravy.

Corn is another starchy food. Green corn stewed with milk is better for us than corn boiled on the cob.

Beans and *peas* are very nourishing. But as they are hard foods, they should be cooked until they are quite soft; and in eating we should chew them very fine.

Turnips, cabbage, parsnips, beets, and *carrots,* too, are hard and should be thoroughly cooked. They are not nearly so nourishing as corn, peas, and beans.

Most of the vegetables that we eat raw, such as lettuce, radishes, and celery, are not so nourishing as the plant foods known as *fruits.*

Fruits.—Raw fruits are not so easily digested as cooked fruits are; but if eaten at breakfast or just after dinner when we are not tired, ripe fruit is

very wholesome food. Fruit should never be eaten at any time unless it is ripe or cooked. A little stewed fruit is a good dish for supper.

Fruits contain sugar, a little mineral food, a great deal of water, and the acids that give them their taste. Acids, like salt, "make the mouth water." Why is this good for us? We cannot be healthy unless we do take a great deal of liquid food, so juicy fruits are useful. Moreover, the sugar of fruits is much purer and better for us than the manufactured sugar that is used in candy and other sweet foods. So fruits are a wholesome sweet food. But they do not contain food for power, or much mending material; and they would not keep us warm, or even keep us alive very long.

Remember that *unripe* fruits are of no use to us at all. Our stomachs might as well try to digest sawdust as a hard green apple. They would have to struggle with the one about as much as with the other; and we should feel pain and might become ill.

Nuts contain a great deal of oil, and are therefore nourishing. But they are so hard that unless they are eaten slowly and chewed very fine indeed, they are not good for us.

Most of the *spices* are fruits. Do you know of

any spices that are not? Pepper, mustard, cloves, nutmeg, ginger, and other spices are used to season food and whet our appetite; but they are not nourishing. They burn the stomach just as they burn the mouth. Sometimes spices are used to cover up the taste of poor food, and then their use is doubly bad.

Candy and Preserves.—There is more sugar than anything else in candy and preserves; and a little sugar, as you know, is not harmful. What is the best time to eat candy? When ought you not to eat it? Remember these two reasons why you should not eat candy between meals: (1) It spoils your appetite for the next meal. (2) It keeps your stomach working; and the stomach needs a little time between meals in which to rest, or it cannot digest the food you give it at the table.

Bread.—"The last the best"! Do you know how bread is made? It contains flour, salt, a little lard or other fat, and yeast (which is made from hops, or from hops and potato). To what kingdom, then, does bread belong? As the chief thing in bread is the flour, we may class it as a vegetable food. Flour contains a great deal of starch. Of what use then is it to your body?

Bread is sometimes called "the staff of life," be-

cause it is so nourishing. But as it contains only a very little fat, it is not a complete food unless it is eaten with butter, or some other oily food. Can you tell why? In Germany, cheese is often used on bread in place of butter; and in Italy, olive oil is used.

Wheat.

We should not eat freshly baked bread. It forms a soft pasty mass in the mouth; and, when swallowed, makes a solid lump in the stomach that is very hard for the stomach to digest.

Graham bread as well as white bread is made from wheat. We can make a bread from corn flour, too, which we call corn bread. What other kinds of bread do you know?

Grains.—*Oats, corn, wheat, rice, rye, buckwheat,* and *barley* are grains. All grains are chiefly starch, and are therefore very nourishing.

What foods do you eat that are made from oats? from rice? from rye? from buckwheat? from barley?

Wheat belongs to the grass family; and like its cousins, it has long, hollow stems. The heads of wheat, as they ripen, turn from green to yellow and grow harder. Each head of wheat shows a cluster of husks or shells, and inside of each of these is a little seed or grain of wheat. It is this inside part that is ground up for flour.

Have you ever opened a hemp seed such as you feed your bird? If so, you know that it is white inside, though a light brown on the outside. Just so, the wheat grain has an outer part and an inner part. The inner part is white; and the outer part, darker.

Corn.

All of this little seed is good for food; and all of it goes into whole-wheat flour, which is yellowish in color. But only the white inside of the wheat grain goes into white flour.

If the yellowish outside of the seed is not used for flour, it is sold separately. This outside layer of the wheat seed is called bran, and makes a very good food for cattle.

In England, all grains are called *corn*. But in our country *corn* means the tall green plant with the broad leaves and waving tassels, and the hard ears with long rows of little kernels. This is sometimes called *maize* or *Indian corn*. Do you know why it is called Indian corn?

X.—A PICTURE LESSON.

Write a story based upon what you see in this picture.

MILLET.

THE GLEANERS.

XI.—QUESTIONS TO BE ANSWERED.

1. Write a list of the foods you would like to eat for breakfast to-morrow; for supper.

2. Tell the source of each of these foods, and to what kingdom each belongs.

3. Tell why you have selected each of these foods, and why it would be good for you.

4. Name some kinds of nuts that are good to eat.

5. Write the names of five fruits.

6. Give the names of five plants whose leaves or stems are used as food.

7. Give the names of five plants whose roots are used as food.

8. From what plants do we get oils or fats?

9. From what plants do we get sugar?

10. Write the names of five foods that are made from grain.

XII.—THE CORN SONG.

A READING LESSON.

Heap high the farmer's wintry hoard!
  Heap high the golden corn!
No richer gift has Autumn poured
  From out her lavish horn!

Let other lands, exulting, glean
  The apple from the pine,
The orange from its glossy green,
  The cluster from the vine.

We better love the hardy gift
  Our rugged vales bestow,
To cheer us when the storm shall drift
  Our harvest-fields with snow.

Through vales of grass and meads of flowers
  Our ploughs their furrows made,
While on the hills the sun and showers
  Of changeful April played.

We dropped the seed o'er hill and plain
  Beneath the sun of May,
And frightened from our sprouting grain
  The robber crows away.

All through the long, bright days of June
The leaves grew green and fair,
And waved in hot midsummer's noon
Its soft and yellow hair.

And now with Autumn's moonlit eves
Its harvest-time has come;
We pluck away the frosted leaves
And bear the treasure home.

There, when the snows about us drift,
And Winter winds are cold,
Fair hands the broken grain shall sift,
And knead its meal of gold.

Let vapid idlers loll in silk
Around their costly board;
Give us the bowl of samp and milk,
By homespun beauty poured!

Where'er the wide old kitchen hearth
Sends up its smoky curls,
Who will not thank the kindly earth,
And bless our farmer girls!

Then shame on all the proud and vain,
Whose folly laughs to scorn
The blessing of our hardy grain,
Our wealth of golden corn!

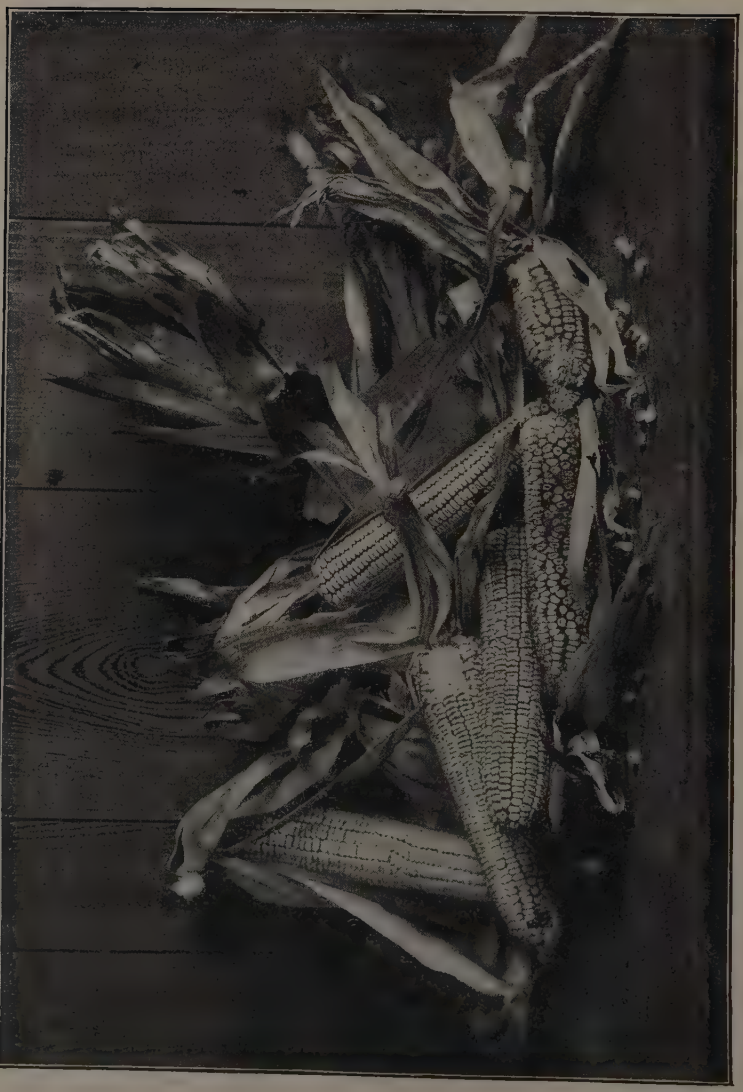
Let earth withhold her goodly root,
  Let mildew blight the rye,
Give to the worm the orchard's fruit
  The wheat-field to the fly.

But let the good old crop adorn
  The hills our fathers trod;
Still let us, for his golden corn,
  Send up our thanks to God!

—*John Greenleaf Whittier.*

XIII.—A PICTURE LESSON.

Write a list of foods made from corn.



CORN IS KING.

XIV.—WHY WE COOK AND HOW WE COOK.

The Reasons Why.—Once a poet, when he was thinking of a good meal, wrote:

> "We can live without friends, we can live without books,
> But civilized man cannot live without cooks."

Probably we *could* live without cooked food, but we could not live *well*. Let us see why.

Before our bodies can make use of the food we give them, the food must be very soft and moist. If it is soft and moist before we eat it, or if we can soften it up in our mouths before we swallow it, our stomachs will not have such hard work in digesting it. But raw potato would not be easy to soften in our mouths; even if we chewed it very fine, it would be too hard for our stomachs to make use of quickly.

Peas and beans, carrots, turnips, and squash are all more soft and tender when cooked. Chicken and beef would be very hard indeed for our stomachs to use if we ate them raw; but there are some vegetables like celery and tomatoes, and there are ripe fruits, that we can easily eat raw.

Which would you rather taste, raw potato or baked potato? raw peas or boiled peas? With the boiled peas there would be salt and pepper and butter, put with them to make them taste better still. When we cook our food we can change the taste a little in this way, as we please, by putting several kinds of food together.

There is still a third reason for cooking. Meat and other foods may have tiny animals or tiny harmful plants living in them. These animals and plants are so small that you could not see them without a very powerful magnifying glass; but if they got inside your bodies, they might grow there and make you ill. Cooking kills such little animals and plants, and makes the food quite safe to eat. For the same reason, we sometimes boil water before drinking it, in order to be sure that it is safe to drink.

Why then do we cook our food? (1) To make it soft enough for our bodies to use easily; (2) to make it pleasanter to taste; (3) to make it quite safe to eat.

How We Cook.—Why does your mother want so many different pots and pans for her kitchen, and why does the stove have an oven as well as room on top? Of course you will say that it is to

cook the food in different ways. You have eaten potatoes that had been put into a kettle of water and *boiled*; potatoes that had been *baked* in the oven; potatoes that had been cut up into small pieces and put into a pan of hot fat and *fried*.

Fried food soaks up the fat in the pan. Fat is good for us, but food soaked in fat grows too solid and heavy to be digested easily. So it is best to eat very little fried food.

Sometimes we cook meat on a grating close to the flame of the fire. The flame melts the fat of the meat, and this drops down through the grating. The heat also browns the meat quickly and makes a crust that keeps the juice from running out of the meat. We call this way of cooking, *broiling*. It is a good way, because it carries away the fat where the meat cannot soak it up. This is the best way to cook chops and steak. Fish, too, is better broiled than fried.

Sometimes food is cooked by *steaming* it; but, as the steam comes from hot water, that way of cooking is much like boiling.

Since people cannot be healthy if their food is not good, they should be careful to choose the right kind of food, and to have it cooked in the proper way.

XV.—AFTER THE RAIN.

A MEMORY LESSON.

On the path that leads to school
Water stands—a little pool;
Stepping high, across we pass,
And see our faces in a glass.

Muddy though our feet may be,
We are glad the drops to see,
Saying: Welcome, merry rain!
Do not fail to come again!

Cities may not like the rain;
Farmers smile when they complain;
Knowing well that for the wheat,
Barley, corn, and hayfields sweet,

Rain must fall on many days.
So we sing our song of praise,
Saying: Welcome, merry rain!
Do not fail to come again!

—*Lydia Avery Coonley.*

XVI.—OUR DRINK.

The thirsty earth soaks up the rain,
And drinks, and gapes for drink again;
The plants suck in the earth, and are
With constant drinking fresh and fair.

—*Abraham Cowley.*

Water, a Necessity.—Water is necessary to life and health. The body craves water more than it does solid food. We need about three times as much water as solid food, for three-quarters of the body is water.

You know that there is a fluid in your mouth all the time, and that you can soon fill your mouth with this fluid merely by sucking your cheeks. Most of this fluid is water. You know that there is a fluid in your eyes; for if enough of it gathers in your eyes, it will roll down your cheeks as tears. In warm weather your hands are very moist, for water from under your skin is coming out on the surface. Just so, every part of the body is moist, and some parts of it are altogether liquid. The blood, which carries the food through the body, is chiefly water. If it were not, it could not flow quickly through the body.

All foods contain water. There is water even in the dry cracker. It forms three-fourths the weight of meat, and three-fourths the weight of potato. But the water we get from the foods we eat is not enough. We need also to drink water. Even milk will not wholly take the place of water.

The body very soon uses up the water that we give it. When the body begins to need more water, we begin to feel *thirst.* Nothing can quench thirst so well as can pure water.

When to Drink Water.—It is not wise to drink much water with our meals. In the stomach and other parts of the body there are certain liquids, or juices, that mix with the food we swallow and help to change it into the material of the body itself. If we swallow much water at mealtime, we weaken, or "thin," these juices, so that they cannot act as they should upon the food we are eating. But we should take as much water as we can at other times during the day, and before going to bed at night.

Ice-cold water chills the stomach so that it cannot do its work properly. If we do drink ice-cold water, we should hold it in the mouth before we swallow it, just long enough to take off the chill.

We should not drink ice water when we are warm from exercising. But there is no reason why we should not drink all the water we want then, if it is not very cold.

Impure Water.—Every once in a while we may read in the newspapers that many people in some city have become ill with typhoid fever. The report probably says that the cause of the fever was impure drinking water. All these sick people had been drinking water that came from the same place. Some dirty water, or other filthy matter, was in the reservoir or in the stream from which they drew water to drink.

Every city appoints a few of its citizens to see that it is kept a healthful place in which to live. These citizens are a *Board of Health.* One of their chief duties is to see that the water supply is kept clean and pure.

But suppose a person lives where he cannot draw from the town water supply. Then perhaps he has a well not far from his house. Anyone who digs a well should be very careful as to its location. It should be as far as possible from any slop hole or barnyard, or other filthy place; for the water from these places may drain into it, and carry poisonous matter into the well water. It

should not be a low place, either; for water from all the land around will run into it. No one should empty water on the ground near a well, for the water will soak through the earth and mix with the well water. As a rule, the deeper the well, the

safer is its water; for water that springs from far down in the earth is quite certain to be pure.

Good drinking water is cool and clear, without taste or smell. If water has taste or smell, other than from such minerals as lime, iron, or sulphur, it may be that it contains tiny plants or animals that

will cause disease. These little plants and animals are so tiny that we cannot see them unless we look at them through a microscope, or magnifying glass. They are called *disease germs.*

When we draw water from a faucet, we should let it run a moment before we fill the glass. Water pipes are made of lead; and if the water has been standing long in the pipes, it may have absorbed some of the lead, forming a poison. So we should let the water run through the pipes long enough for all that has been standing to run out, and for fresh water to enter the pipes.

Other Drinks.—*Milk,* as you know, is part solid food and part water. What do we call the thick part that rises to the top of milk that is left in a bottle or pan? What kind of material is this part? Milk is, of course, more nourishing than water; and it is far better than all other drinks.

Tea and *coffee* are mostly water. The tea and the coffee themselves are neither food nor drink. They are not nourishing at all, and only act as a whip to the body. Whipping a tired horse may make him go, but it cannot make him any less tired or do him any bodily good. On the contrary, it does him harm. He gets more and more tired while he is going under the *stimulus,* or excitement,

of the whipping. The word *stimulus* comes from a foreign word that means "whip." Drinks like tea and coffee, that do not nourish us, but only whip us on so that for a little while we do not feel tired, we call *stimulants*.

There are other stimulants that are more harmful than tea or coffee. These are the drinks that contain alcohol; such as *beer*, *cider*, *ale*, *wine*, *gin*, *brandy*, and *whiskey*. Gin, brandy, and whiskey are the most powerful, because they contain the most alcohol; they are very harmful indeed. Alcoholic drinks do not quench thirst; they make one still more thirsty. Just why alcoholic drinks are so bad for the body, we shall learn in a later lesson. In the meantime, let us remember that the most wholesome drink is pure, fresh water.

XVII.—A PICTURE LESSON.

Write a story based upon this picture. Use some of the facts taught in the preceding lesson.

MEYER VON BREMEN.

AT THE WELL.

XVIII.—THE CAPTAIN'S WELL.

A READING LESSON.

[The story of the shipwreck of Captain Valentine Bagley, on the coast of Arabia, and his sufferings in the desert, has been familiar from my childhood. It has been partially told in the singularly beautiful lines of my friend, Harriet Prescott Spofford, but in the following ballad I have endeavored to give a fuller detail of the touching incident upon which it is founded. —THE AUTHOR.]

From pain and peril, by land and main,
The shipwrecked sailor came back again;

And like one from the dead, the threshold cross'd
Of his wondering home that had mourned him lost;

Where he sat once more with his kith and kin,
And welcomed the neighbors thronging in.

But when morning came he called for his spade,
"I must pay my debt to the Lord," he said.

"Why dig you here?" asked the passer-by;
"Is there gold or silver the road so nigh?"

"No, friend," he answered, "but under this sod
Is the blessed water, the wine of God."

"Water! the Powwow is at your back,
And right before you the Merrimac,

"And look you up, or look you down,
There's a well-sweep at every door in town."

"True," he said, "we have wells of our own,
But this I dig for the Lord alone."

Said the other: "This soil is dry, you know,
I doubt if a spring can be found below.

"You had better consult, before you dig,
Some water-witch, with a hazel twig."

"No, wet or dry, I will dig it here,
Shallow or deep, if it takes a year.

"In the Arab desert where shade is none,
The waterless land of sand and sun,

"Under the pitiless, brazen sky,
My burning throat as the sand was dry.

* * * *

"Then something tender, and sad, and mild
As a mother's voice to her wandering child,

"Rebuked my frenzy; and bowing my head,
I prayed as I never before had prayed:

"'Pity me, God! for I die of thirst;
Take me out of this land accurst;

"'And if ever I reach my home again,
Where earth has springs, and the sky has rain,

"'I will dig a well for the passers-by,
And none shall suffer from thirst as I.'

* * * *

"God heard my prayer in that evil day;
He led my feet in their homeward way.

* * * *

"Now the Lord be thanked, I am back again,
Where earth has springs and the skies have rain,

"And the well I promised by Oman's Sea,
I am digging for him in Amesbury."

His kindred wept, and his neighbors said:
"The poor old captain is out of his head."

But from morn to noon, and from noon to night,
He toiled at his task with main and might;

And when at last, from the loosened earth,
Under his spade the stream gushed forth,

And fast as he climbed to his deep well's brim,
The water he dug for followed him,

He shouted for joy: "I have kept my word,
And here is the well I promised the Lord!"

The long years came, and the long years went,
And he sat by his roadside well content.

He watched the travelers, heat-oppressed,
Pause by the way to drink and rest,

And the sweltering horses dip, as they drank,
Their nostrils deep in the cool, sweet tank;

And grateful at heart, his memory went
Back to that waterless Orient,

And the blessed answer of prayer which came
To the earth of iron and sky of flame.

And when a wayfarer, weary and hot,
Kept to the mid-road, pausing not

For the well's refreshing, he shook his head:
"He don't know the value of water," he said;

"Had he prayed for a drop, as I have done,
In the desert circle of sand and sun,

"He would drink and rest, and go home to tell
That God's best gift is the wayside well!"

—*John Greenleaf Whittier.*

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XIX.—DIGESTION IN THE MOUTH AND THE STOMACH.

Digestion.—A plant uses the different materials of the soil for blossoms and leaves and stems. How does it carry the materials up through its stems to its leaves and flowers? If you have crushed a stem between your fingers, you know that it made your fingers wet. If once you dug a knife into the bark of a pine or a maple, you saw a liquid run out of the tree. This liquid or sap goes through the plant, carrying fresh food to every part. Where does the sap get the food? It gets it from the roots; and the roots get it from the soil.

In our bodies, blood is the sap that flows to every part, carrying fresh food material. And how does the food get into the blood? If you cut your finger, the blood that you see does not look as if it contained meat and potato and egg and milk. Some wonderful change, then, must be going on in our bodies to prepare the food for the blood. This is the change called *digestion*.

By digestion, the food which we eat is softened and changed. The useful part becomes a liquid,

ready to be taken into the blood; and the waste parts are separated from the parts that our bodies need.

Mouth Digestion.—Most food is prepared for digestion by cooking. Now let us see what happens to the food in the mouth.

What have you in your mouth to help in the work of digestion? You have teeth, a tongue, and a watery fluid. This fluid is called *saliva.*

What do your teeth do to help to digest your food? What does your tongue do?

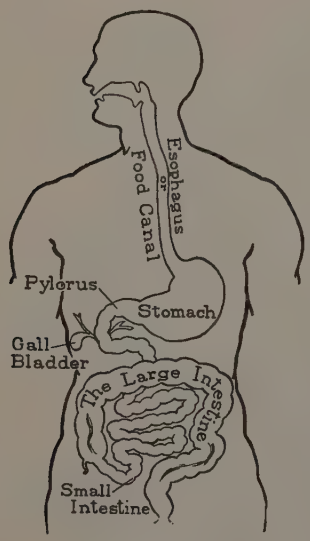
As you move your tongue about your empty mouth, you will notice that your mouth fills with saliva. This saliva comes from little pockets, or *glands,* that are in your cheeks and under your tongue. They are called *salivary glands.*

Moving your jaws in chewing, and moving your tongue in pushing your food about, causes the saliva to flow very fast indeed. Of what use is it? To soften the food is to change only its form; but the saliva does more than this. It acts on some food in a way that really changes it. This is the first change in making the materials of food into the materials of the body.

We should eat slowly in order to give the teeth a chance to grind up the food, and also to allow

time for the saliva to become well mixed with the food.

Put out your tongue and look at it carefully in a mirror. Close your teeth together over your tongue and draw it slowly back. You will see that the surface of your tongue is not smooth, but is covered with little red and white bunches. Inside of these are tiny *taste-buds*. It is these little taste-buds that enable us to taste our food.



From the Mouth to the Stomach. — At the back of your mouth is an opening. This is the beginning of your throat. In your throat there are two downward passages. The one at the front is the *windpipe*. The air that you breathe in through the mouth or the nose goes down through this pipe into the lungs. The passage back of the windpipe is the one through which the food passes from the mouth to the stomach. This is a tube about nine inches long, and is called the *esophagus*. You can hardly count five before a swallow of food from your

mouth is down your esophagus and into your stomach.

Why doesn't the food get by mistake into the windpipe? It may if you laugh or talk while you are eating, and then you will choke. But every time you swallow, whether food or only the saliva in your mouth, a little cover shuts down over the windpipe and keeps food or saliva from going down the wrong way.

Stomach Digestion.—The lower end of the esophagus opens into a kind of bag. This bag is the *stomach.* The walls of the stomach are very elastic. The stomach is quite flat when it is empty, and well rounded out after a hearty meal.

The stomach narrows again at its lower end and forms the beginning of another tube. Here is a little gate-keeper, or valve, called the *pylorus.* This little valve will not open to let the food into the lower tube until the stomach is quite through with it.

In the walls of the stomach are numberless little pockets, or glands. These store up a fluid, or juice, that is much more powerful than the saliva is. It is called the *gastric juice.*

As soon as food gets into the stomach, the walls of the stomach begin to move, and the gastric

juice flows out quickly and mixes with the food. The movement of the walls of the stomach sends the food back and forth, as if it were being churned. And all the time that the food is being pushed about, it is being thoroughly mixed with the gastric juice that is oozing over it from all the little glands of the stomach.

The gastric juice dissolves the food still more, and changes it more than the saliva did. By the time the stomach has finished its part in digestion, the food is a very soft mass. Some of it is liquid and is absorbed through the walls of the stomach into the blood vessels.

As the stomach churns away from two to four hours after every meal, we should have our meals fully four hours apart. The stomach must have a little time in which to rest after it has been churning; so our meals should be at the same regular time each day, and we should not eat between meals.

RULES OF THE GOOD HEALTH CLUB OF —— SCHOOL.

1. We should eat slowly.
2. We should eat regularly, and not between meals.
3. We should not eat too much.

XX.—DIGESTION IN THE INTESTINES.

Digestion in the Small Intestine.—The lower end of the stomach, as you have learned, becomes narrow again and forms the beginning of another tube. This tube below the stomach is called the *intestines*, or *bowels*.

The part of the intestines into which the stomach opens is called the *small intestine*. This tube is about twenty feet long and between one and two inches wide. It is coiled up closely in many folds, just below the stomach.

In the wall of the small intestine are little glands from which another digestive juice flows into the intestine.

Besides the juice from its own little glands, the small intestine contains two other juices. These it receives from two large glands outside itself. One is the liver, which lies above the stomach and a little to the right of it. The other is the *pancreas*, which lies just below and behind the stomach.

The liver is very large, and of a dark red color, and looks not unlike the calf's liver that we buy at the market. It weighs about three and a half

pounds. The pancreas is smaller. Both the liver and the pancreas are connected with the small intestine. The juice that the liver pours into the small intestine is called *bile*. The juice that the pancreas gives is called the *pancreatic juice*. Both of these liquids are very necessary to digestion.

These three juices—the juice from the glands of the small intestine, the bile, and the pancreatic juice —mix with the food as it passes slowly through the small intestine, and help still more to change, or digest, it.

After the food in the small intestine has been thoroughly mixed with these three juices, it is almost all liquid. It is nearly all digested and ready for the blood. How is the digested food to enter the blood?

Absorption of Food.—In the walls of the small intestine are millions of tiny tubes through which blood is flowing. As the food is passed slowly along in the intestine, its liquid part soaks through the walls of these tiny blood tubes, and mixes with the blood in them. Then the blood carries this supply of fresh food material to every part of the body; and each part of the body picks out from the blood just what it needs to make it strong.

The Liver and Pure Blood.—The first place to which the blood flows, after it leaves the small intestine, is the liver. The liver is an important organ; for, besides making the bile that it sends down into the small intestine, it helps to keep the blood pure. The blood may gather some harmful substances from the body, or it may take up some disease germs with the liquid food. In either case, the liver tries to destroy these poisons or keep them from going to other parts of the body.

The Large Intestine.—The lower end of the small intestine opens into a larger tube. This larger tube is called the *large intestine* or *colon*. The large intestine is only about five feet long, and is the last part of the intestinal tube.

After the little blood vessels of the small intestine have taken up all the digested food, there is left behind only water and undigested or useless matter, such as seeds, hard portions of raw foods, husks, peelings, and the like. These waste substances pass from the small intestine into the large intestine, and are driven on, and out of the body. If this waste matter is not driven out of the body regularly every day, we have sick headache and feel dull; and we may become very ill, for these waste substances are sure to poison the body if they stay.

Mouth, esophagus, stomach, small intestine, and large intestine are the names of the different parts of the one tube through which the food passes in digestion. The upper opening of the tube is at the mouth, the lower opening is at the end of the large intestine. The widest part of the tube is the stomach. The whole tube from beginning to end is called the *food canal.*

Summary.—Now let us repeat just what it is that takes place in digestion:

1. It is chewed and mixed with the saliva in the mouth, which softens it and partly changes it.

2. It is swallowed.

3. It is mixed with the gastric juice in the stomach, which makes it very soft and changes it still more.

4. It is mixed with three juices in the small intestine: the fluid of the small intestine itself, bile from the liver, and pancreatic juice from the pancreas. These make it liquid, and change it still further, so that it is ready for the blood.

5. In the small intestine most of the fluid portion of the food soaks through the walls of the blood vessels and mixes with the blood.

6. Undigested food and waste matter pass into the large intestine and are driven from the body.

XXI.—IMPURE FOODS.

A READING LESSON.

The more we know about our wonderful bodies, the more do we see that we each live in a "House Beautiful." Without wholesome food we cannot keep these bodies in which we dwell beautiful and sound.

Why We Have Manufactured Foods. — If we should eat all our food just as Mother Nature prepares it for us, we should have it pure at least. But we should not have the variety of food that we can make by mixing natural foods together in manufacturing and cooking; and we could not supply our tables, summer and winter with all kinds of pleasant and digestible dishes.

The Indians used to pound grain with stones to get the little seeds out of the husks and to powder them into flour for bread. Our flour is ground in mills, where the giant machinery turns out thousands of pounds of it a day. It is baked into bread in large bakeries that make thousands of loaves a day.

We cannot have green peas and tomatoes and

peaches in winter, unless in summer we put them into air-tight cans or jars, so that they will keep. It is sometimes more convenient for us to buy foods already canned than to put them up this way ourselves.

In tropical lands where the sugar cane grows, the country people suck sticks of sugar cane to get the sweet sap. We find the white crystals or powder in which sugar appears on our tables a much more convenient form in which to use it. This sugar has been manufactured in huge mills.

Why Foods Are Adulterated.—Most of these different factories prepare food for us far better and more cheaply than we could possibly do it ourselves. But some manufacturers put poor and even harmful materials with the food, because these materials are cheaper; or they sell one kind of food under the name of another.

We call such impure foods *adulterated* foods. Adulterated food has become so common that we have laws known as *pure-food laws*. These laws are necessary to protect people from being cheated or made ill by the sale and use of bad food.

Adulterated Foods.—The foods most often adulterated are sugar, candy, sirup, milk, butter, chocolate, coffee, flour, baking powder, bread, and jellies.

Sugar, sirup, and candy are sometimes made from glucose, a sugar obtained from corn. It is not so good as sugar from sugar cane. It is quite likely to sour and decay within the body, and to cause disease. Candies, besides being made of adulterated sugar, are often colored with poisonous matter.

Milk is often adulterated by the addition of water and some white substance, such as chalk. Sometimes a harmful drug is put into the milk to keep it from souring. Then the milk, no matter how stale it is, is sold for fresh milk. Such milk is poisonous. Because milk is so easily spoiled and adulterated, nearly every large city has officers whose business it is to examine all the milk brought into the city for sale. If the milk is found to be unfit for use, it is destroyed.

There is an imitation butter that is made entirely from lard, tallow, and cotton-seed oil. With each package is supplied coloring matter which may be used to make this imitation butter look like the pure yellow butter made of rich cream. This imitation butter is called butterine, or oleomargarine. It is not poisonous, but it is not so wholesome or so pleasant as real butter. In the United States there is a law against the sale of butterine,

unless it is so stamped as to show plainly to the person buying it that it is not genuine butter, but an imitation.

The chief way of adulterating flour is by adding very fine corn flour or corn meal, which is not so nourishing as pure wheat flour. It is heavier than wheat flour; and as flour is sold by weight, the person who buys it at the higher price of pure wheat flour, is cheated.

Bakery bread and cake often contain ammonia that has been used to make the loaf lighter and whiter. Not only is ammonia harmful, but a loaf of bread made in this manner weighs less than the same sized loaf properly made.

Baking-powder is often made with alum. Any baking-powder containing alum is harmful.

Home-made jellies and preserves are made from the juices of fruits mixed with pure sugar. But such jellies and preserves are expensive to make. Some manufacturers make a cheap jelly out of a glue-like substance called gelatine. To this they add the coloring matter and the acid that will give it the color and the taste of currant, grape, strawberry, or whatever other fruit they may wish to imitate. In making preserves, they may add harmful coloring matter to imitate good fruit, and use

glucose in place of sugar. Glucose is a sweet substance obtained from different plants. It is cheaper than sugar and not so wholesome.

Much of the cheap strained "honey" that we buy was never in a flower or a honeycomb. Some of the "maple syrup" that is sold is only an imitation of sugar-maple sap, and is made in a city factory. There is so-called "cider-vinegar" that contains not one drop of apple juice, but only acids that burn our throats and stomachs.

There are many other adulterated foods, but these are enough to show you why people should insist on having a pure-food law, and should see that the law is obeyed.

Diseased Foods.—Sick animals are sometimes killed and sold for food. The flesh of sick animals contains disease germs, though the meat may look perfectly good. How can we guard against taking disease germs into our bodies in the food we eat?

Milk from sick cows contains disease germs. To prevent the sale of such milk, the dairy farms are examined to make sure that the milk from healthy cows only is sent out.

Vegetables, also, may be diseased. When vegetables decay or spoil, disease germs are growing in them.

Canned foods, especially canned meats, spoil very quickly after being opened to the air. All canned food should be eaten the day it is opened.

RULES OF THE GOOD-HEALTH CLUB OF —— SCHOOL.

4. We should avoid foods hard to digest, such as pastry.

5. We should not eat unripe, or overripe, or decayed fruits.

6. We should avoid adulterated foods; for while they are cheaper, they are dear at any price.

XXII.—FALSE APPETITES.

What is a False Appetite?—If your dog has eaten a good meal and then you offer him another bone, what will he do with it? He may play with it awhile; he may carry it off and bury it to keep it safe for another time; but he will not eat it unless he is really hungry. If you had just finished a hearty dinner and some one should offer you some figs or nuts, would you refuse them or ask if you might keep them until another time, or would you try to eat them then?

Animals know how to take care of themselves. It is only people, who are supposed to know so much more than animals, who are careless of their health. Is it not strange that it should be so? A person will eat or drink just because the taste of a thing is pleasant to him, not because his body needs the food or drink. If his body does not need it, he has no real appetite for it. He takes it just to please his taste and grows to think he needs it. He makes a *false appetite.*

Temperance and Intemperance.—All the food or drink that we take does one of two things: either

it builds up our bodies and makes them stronger, or else it tears them down and makes them weaker. To control our appetite so that we take only what is good for us, and only so much as is good for us —that is *temperance*. To take what will do us harm, or more than will do us good, just for the pleasure of taking it—that is *intemperance*.

Alcohol.—Alcohol is as clear and colorless as water; but as a drink it is just the opposite of water. If you have had your throat or chest rubbed with alcohol when you had a cold, you know how strong it smells. If you have seen it used in an alcohol lamp, you know how quickly it flames up when it is lighted, and how soon it is all burned out. That is just what alcohol does inside the body; it burns. It burns and destroys the parts of the body. It does not quench thirst. It makes the mouth and the throat drier, and the person who drinks it more thirsty still.

Alcohol Not a Food.—Is alcohol a food? No; it does not nourish the body; it does not give it more strength; it does not make it warmer. It might seem for a few moments to warm it; but the feeling would not last long, and in a few moments the body would feel colder than before. It might for a few moments make us feel brighter and more

lively. Why would it? It would be only like the whip used on a tired horse. It would excite us, but it would not help us. Afterward we should be duller and slower than before. What do we call a drink that excites, but does not nourish us?

Athletes Drink No Alcohol.—No young man who is being trained in athletics ever touches alcohol. His trainer would not allow him to do so; for there would be no use in helping a man to build a splendid body, if the man were all the time taking something to tear it down. The athlete must have food to give him strength and quickness. He would stand no chance of winning in a contest if he should take drinks made of alcohol.

If an athlete drinks alcohol—if he "breaks training," as it is called—his comrades look down upon him. Why do they? Because he was so weak as to give up the thing he set out to do just for the pleasure of a taste.

Alcohol and Habit.—Most alcoholic drinks are not pleasant when first tasted. Some burn the mouth and throat. A man has to learn to like them. And what a silly thing to do—to try to like a thing that is harmful! But the young man thinks it "looks big" to drink with other men. He is afraid of being laughed at, and not thought manly, if he re-

fuses. If he only knew how much more manly it would be to refuse! Not only would he save his own health; he might help his companions by setting a good example.

Most men begin by taking just a little, once in a while. But very few men who once begin to drink find it easy to stop. That is the queer thing about alcohol; it starts a craving for more. Then the man will take stronger liquors and take them oftener, until he has so broken down his health that he is weak-minded as well as weak-bodied. Then he cannot stop. The drunkard cannot reason; he cannot remember; he cannot do what he makes up his mind to do; for he has whipped and abused his body, instead of feeding it, until it has broken down. Can such a man be a useful citizen?

The Waste.—Suppose a man threw his money into a deep stream. Would it harm him? Would it harm anyone else? How might he have used it for himself? How might he have used it for others? Suppose he spends his money for liquors. How is it wasted then?

Millions of dollars' worth of grains and fruit are wasted every year in making alcoholic drinks. These liquors are made by allowing the grains and fruit to *ferment*. Perhaps you have smelled pre-

serves that have grown strong and sour because the top of the jar had not been screwed down tight. Air had entered the jar. In the air are tiny particles—so tiny that no one can see them with a naked eye—that are really living plants. These are called *yeast* plants. The manufactured yeast that we use to make bread light is a small cake of flour in which there are some of these little yeast plants. When these plants get into food materials that are mostly starch and sugar, they grow there and cause the food to sour, or ferment. While food is fermenting, alcohol is forming in it.

Rye, wheat, corn, and other grains that should have been used in making food, are allowed to ferment to make the drink called whiskey. Barley is fermented to make beer, and grapes are fermented to make wine. People of the United States spend many millions of dollars more for strong drink than for bread and meat. They spend more for what will hurt the body than for what will build it up.

The Happiness of Health.—How fine it is to have a good strong body! How clearly you can think, how much you can do, how well you look! You need no whip, or stimulant. All that you need is fresh air, proper and regular exercise, pure water, good food, and sunshine.

XXIII.—A PICTURE LESSON.

Write a story based upon this picture.

THREE MEMBERS OF A TEMPERANCE SOCIETY.

HERRING.

XXIV.—A DECEITFUL FRIEND.

A good farmer, you know, keeps his fields free from weeds. Yet there is a weed that farmers plant. Some farmers carefully tend a field of this weed, and watch that neither worms nor insects eat holes in its broad green leaves.

Why does the planter take such good care of a patch of weeds? This weed cannot feed the hungry, as do wheat and corn. It cannot be used for clothing, as can cotton or flax. It cannot be made into paper on which to print books. Yet men will use less or poorer food in order to have money to buy leaves of this weed. They will buy poorer clothes and go without good books in order to have tobacco to smoke. Why do they do it?

Why Is Tobacco Used? — One man says he smokes to make his brain work faster. He says tobacco helps him think. Another man says he smokes to quiet his brain and make him stop thinking. Each supposes that tobacco is his friend. They are both deceived. The truth is that this weed is an enemy to growth, health, and cleanliness. Men learn to like this deceitful friend, and that is

the only reason why they use it. They seem not to care if it brings harm to them.

Boys think they are big men when they stain their fingers and teeth and tongue with the cigarette. They learn too late, when they have poisoned their bodies and stopped their growth, that it was a deceitful friend.

The Harm of Tobacco.—Tobacco contains a strong poison, called nicotine. It may cause weak eyes, and even total blindness; and it may lead to very serious disease of the throat, heart, or lungs.

The effect of tobacco on a person over thirty years of age, when he has entirely grown, depends on the amount he uses and his own strength. The safe rule is never to use it. Men never regret not having formed this needless habit.

The use of tobacco is not good for the body at any age. A man is never made stronger or healthier by it, and a growing boy may be harmed for life by using it.

It checks the growth of the boy. It stunts both his body and his mind. It weakens his nerves. It hurts his stomach. It spoils the effect of good food. It lessens his appetite for good food. It makes it less possible for him to become a big, strong, healthy man.

The head of a large firm, a man who employs a great many boys to work for him, has said that tobacco makes a boy tired, stupid, and lazy; that it makes him cross, and careless of the rights and feelings of others. And worse than this, that it makes some boys lie and even steal in order to get it. A boy who smokes cannot work rapidly or steadily with his brain or hands. Many business men refuse to hire boys who use tobacco.

If a boy smokes, his heart beats too fast and he becomes short of breath. He is not likely to win in athletics. No young man who uses tobacco can be on any college football team, baseball nine, or boat crew.

Schoolboys and Cigarettes. — The very worst form of tobacco is the cigarette. Most cigarettes contain a bad drug, and the paper is usually made by the use of poisons. The principal of one of the public schools of Chicago watched carefully for three years the effect of the cigarette habit on her boys, and this is what she found:

One hundred and twenty-five boys in that school smoked from two to twenty cigarettes a day. And what was the result? Not more than ten of these were able to keep up with their classes. These one hundred and twenty-five boys were far behind the

boys of their own age. Most of them were from two to five years older than the average age of the boys in their grade. Nine-tenths of the boys were disorderly and hard to get along with; and these cigarette smokers were the only boys in the school who ever played truant.

The principal of that school was very fond of her boys and thought that if they only understood how much this cigarette smoking harmed them, they would give it up. So she persuaded some of the boys to form a club that should be against the use of tobacco. Most of the boys joined the club, and here are some of the things that those who had smoked told about themselves:

Twenty-four of the boys said that they could not learn their lessons, because most of the time they were too sleepy to study. Thirty said that they were always dizzy after smoking, and did not feel like thinking. Twenty-two said that they could not write neatly because their hands trembled. And some actually said that they "felt shaky" when they walked. A great many of them admitted that they could not run any distance, though, before they began to smoke, they could run as far as any one. Nearly all said that they had headaches constantly; and that even when they

were kept after school, they could not learn their lessons.

This same principal found out that in the public schools of Chicago alone there were about 5,000 boys who smoked cigarettes every day; and that only about 400 of these were able to keep up with their classes.

Does any boy need better proof that smoking cigarettes is very bad for both his body and his mind?

Many states take care of their boys by means of wise laws that forbid the sale of cigarettes to boys. Every boy who wants to be a strong man and a good citizen will do all he can to help enforce these laws. Then bright, growing boys will not be robbed or cheated of their health by this deceitful friend.

XXV.—A WRITING LESSON.

Write these sentences:

1. Tobacco is a weed.

2. Tobacco is a poison.

3. Tobacco injures the muscles, making them small and weak.

4. Tobacco does not help the stomach to digest food. It hinders digestion.

5. Tobacco causes headaches and coated tongues, which are signs of poor digestion.

6. Tobacco stunts the growth of the young.

7. Tobacco discolors the teeth and makes bad breath.

8. Tobacco costs money that should be spent for food, clothes, books, and to make others happier.

9. Tobacco makes boys think they are smart, while it really makes them lazy and stupid.

10. Tobacco is a deceitful friend.

XXVI.—TEETH.

QUESTIONS FOR STUDY AND OBSERVATION.

Take a hand-glass and look at the reflection of your open mouth, while you stand facing the light.

How many teeth have you in your lower jaw? How many in your upper jaw? How many teeth have you on each side of one jaw? Are the teeth arranged just alike on both sides? Have any of your teeth come out or been pulled out? Did a new tooth come in place of each of these? How many sets of teeth have you had? Do you know how many teeth you had in your first set?

How old is a baby when he begins to cut his teeth? How old were you when your first teeth began to come out? When you are about twenty years old you will probably have four teeth more. These will grow back of the last double teeth that you have now on each jaw. They are called *wisdom* teeth. A grown person should have thirty-two teeth.

What is the difference in the shape of the front and the back teeth? Which teeth do you use most

when you eat meat? For what do you use your front teeth?

How are a dog's teeth shaped? a horse's? What kind of food does each eat?

If you live in the country, observe how a horse bites grass; how a cow; a sheep. Why do these animals bite the grass differently?

Do birds have teeth? Why does a canary swallow sand from the bottom of its cage? Why do hens pick up gravel?

Did you have any difficulty in speaking plainly when your first teeth were coming out?

How do teeth help to preserve the shape of the face?

If you cut your finger, the cut parts soon grow together again. Your body, when it is injured, begins at once to mend itself. If you break off a tooth, does it grow out again? If you let a tooth decay, does it mend itself?

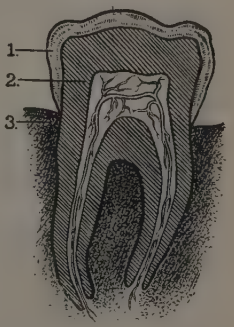
How is it possible for bad teeth to affect digestion?

What are the different uses of teeth?

Why should we take care of our teeth? How do you care for your teeth?

XXVII.—THE FORMATION AND CARE OF THE TEETH.

The Parts of a Tooth.—The next time that one of your teeth comes out, look at it carefully before it is thrown away. You will see the small shiny part, or *crown*, that showed above your gum; and besides that, a longer, dull whitish part, the *root*, or *fang*, that was down in your gum and held the tooth in place. If you are looking at a front tooth, you will find the root in one piece. If the tooth is a back, or double, tooth, you will find the root divided into two or three prongs.



1. Enamel.
2. Soft bone.
3. The gum.

The hard, shiny surface of the crown is called *enamel*. This enamel is very thin and cracks easily. Almost all the rest of the tooth is a soft kind of bone. Little nerves and blood vessels go up through the root into the soft part of the crown.

Since the soft part of the tooth is bone, of what mineral substance is it chiefly made? If there is

not lime enough in the teeth, they are likely to decay quickly and crumble away.

The Kinds of Teeth.—You have noticed that the front teeth, which you use for biting, are wedge-shaped, with a sharp, thin edge, and that the back teeth, which you use for grinding, are broad and flat on top. Start at the middle of either jaw and look at the teeth around one side. The first two teeth are sharp. They are called *incisors*, because they are used to make incisions, or cuts. Next to the incisors is a very strong and firmly set pointed tooth. This is like a dog's tooth, and is called a *canine*. Back of the canine are two teeth that have each two points. These are called *bicuspids* (two-pointed teeth). Back of the bicuspids are the flat "grinders," or *molars*. When all the second teeth have come in, there are three molars on each side of the jaw.

Front tooth.

Back tooth.

In each jaw how many of each of these kinds of teeth have you?

The Care of the Teeth.—The enamel is like an armor, and protects the teeth from decay. Cracking nuts with the teeth, or biting hard candy, often breaks the enamel. So may the sudden cold of ice-

water, or the sudden heat of hot food. If the enamel cracks, and the soft bone is laid bare, the tooth soon begins to decay. The teeth should be examined regularly twice a year by a dentist, so that any holes or cavities may be filled at once. Remember that toothache is not the worst penalty we pay for neglecting our teeth. Nature gives us only two sets; and if we do not take good care of our second set, we may have to go without teeth, or wear false ones.

We are careful to clean our nails, because the dirt under them is so easily seen by others. But black finger nails do not mar our looks so much as yellow, decayed teeth do.

Water, a good tooth-powder or some Castile soap, a toothbrush, and a fine silk thread or a rubber band are all that are needed to keep the teeth clean. The toothbrush should be used at least twice each day—in the morning directly after breakfast, and in the evening just before going to bed. After meals use the fine silk thread or the rubber band, or a soft wood or quill toothpick, to push out from between the teeth any bits of food that may have lodged there. Never use a pin or a metal toothpick. It may scratch or pierce the enamel.

Teeth that are kept clean are less likely to decay, for decay begins on the outside of the tooth, not within it. The care of the teeth is largely a habit. This habit once formed, you would no more think of going to school without brushing your teeth than of going without washing your hands and face, and combing your hair.

Never hold a rubber elastic by your teeth and then stretch it out and twang on it. And do not use your teeth to bite off thread or string. You will jar the roots of your teeth, and may loosen them; and you are likely, too, to hurt the enamel.

It takes so little time each day to care for our teeth while we are young, and it takes so much time, pain, money, and trouble, to pay for poor teeth as we grow older, that it is well worth our while to use a toothbrush a few minutes every day.

Write some rules about the care of the teeth for the Good Health Club of your school.

XXVIII.—THE BLOOD.

You have learned now that all the food we take becomes a liquid that can be absorbed by the blood, and that it passes into the blood tubes from the stomach and the small intestine. You know that the blood goes to every part of the body to feed and repair it, and that each part of the body selects from the blood just the food it needs for repair and growth.

What the Blood Contains. — If you were to crumble up a little of the red paint in your paint-box into half a glass of water, you would have what would seem to be just a red liquid; but it would be the fine powder of red paint floating in the water that would give it the color. If you look at a drop of blood through a microscope, you will see plainly what seems to be water with millions of tiny disks, or cells, in it. Most of these cells are a reddish yellow; and when a great number of them are crowded together, as they are in the blood, they look red. It is these reddish cells that give the blood its color. There are also, in the blood, white cells; but in a healthy grown person there are several hundred red ones to every white one.

These cells are called blood *corpuscles.* "Corpuscle" means "little body" or "little object." The blood consists then of red corpuscles. white corpuscles, and a clear colorless fluid.

The Red Corpuscles.—The red corpuscles are food carriers. They carry through the body both liquid food and *oxygen.* Oxygen is a gas. It is in the air that we breathe into our lungs. We could not live without it. The red corpuscles take it from the air while the blood is passing through the lungs.

The White Corpuscles.—The white corpuscles move about as if they had minds of their own and could choose where to go. Seemingly, they float in the blood only as an easy way of being carried about; for they do not always stay in the blood. Sometimes they slip through the wall of a blood vessel and busy themselves in the flesh near by, eating up waste bits or disease germs there.

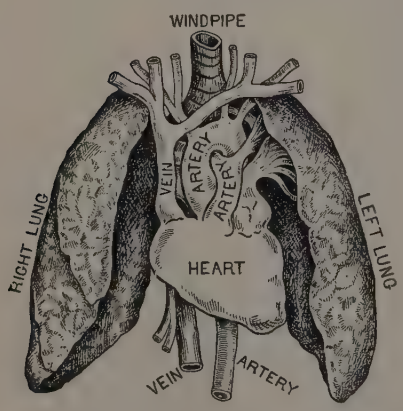
If you scratch or cut your finger, and a little dirt gets into the cut, a great number of white blood corpuscles "rush to the scene of the accident," as it were. They try to devour any germs that have come in with the dirt, and they try to push out of the sore any matter that they cannot absorb. If the finger is inflamed, or white (*festered*)

around the edges of the cut, you may know that there is a hard fight going on between the poison germs and the white cells of the blood. It is best to save this trouble by washing a cut or wound of any kind in clean water as soon as possible, and before it is bound up.

XXIX.—HOW THE BLOOD CIRCULATES.

How the Blood Travels.—As the blood must flow up to your head as well as down to your feet, it has to be pumped to keep it moving. The pump is the *heart.*

The blood passes through the body in tubes or blood vessels of different sizes. The tubes through which the blood is carried out from the heart to the various parts of the body are called *arteries.* The tubes through which the blood flows back to the heart are called *veins.*



The arteries are quite large near the heart, but they soon divide into branches. These branches divide again and again, until they are very small and thread-like. These finest branches are called *capillaries.* They are everywhere in the body, around the bones and nerves and muscles. The walls of the capillaries are very thin. Some of the

blood soaks through the sides of the tubes and supplies the near-by parts of the body with food, which they are always ready to take in and use.

At the same time that the blood in the capillaries is unloading food, it is loading up with waste matter. The capillaries join again to form larger tubes, the veins. As the veins get nearer to the heart, the smaller veins come together to make larger veins. These in turn unite into one large vein that empties into the heart.

The Heart.—Put your hand on your chest, a little toward your left side. Can you feel your heart beating, or throbbing? The heart is a muscle bag with thick elastic sides. When it becomes full of blood, it has the power to make itself smaller by squeezing the blood out. Each squeeze is a *heart beat.*

The heart is a live pump that keeps going as long as we live. If it stops pumping, we die. Even when we are asleep and our body is resting, the heart is keeping up its regular pumping, sending the blood out into the arteries. And just as water comes from the mouth of a pump over a well,—a gush of water and then a pause; another gush and then a pause,—so the blood is pumped, or squeezed, out of the heart.

The Pulse.—The gush of blood into the arteries stretches the walls of the arteries. The walls of the arteries are elastic; and as the blood goes through, they pinch together again while the heart is pausing. Then the next gush of blood stretches the arteries wide again; and again they narrow down, as the blood goes through. If you put your finger on your wrist, or on your temple, you can feel an artery stretching and narrowing in regular beats, as the blood gushes through. This movement of the walls of the artery is called the *pulse*. It tells how fast the blood is flowing through the artery, and therefore how fast the heart is beating. Find your pulse. Count the number of beats in one minute. Why does the doctor feel the pulse of a sick person?

The Circulation.—When a drop of blood starts out on its trip around the body, its red cells are full of the oxygen that they took from the air in the lungs. The heart squeezes this scarlet blood into a big artery; and the blood goes on through branching blood vessels, and into a network of capillaries.

While the blood is traveling through the capillaries, it gives out food and oxygen and takes up waste matter. In doing this, it grows more and more impure, and changes, little by little, from a bright red color to a dull purplish red.

This drop of blood keeps on through the capillaries to where many capillaries join to make one of the smallest veins. It passes into this vein, and on from one vein into another, until it gets back, through one big vein, into the heart again.

Now it must be sent to the lungs, where it can give up some of its waste matter, and take in fresh oxygen again. So the heart forces this impure blood through a big artery that takes it to the lungs. Here it rids itself of such waste matter as the lungs can take and breathe out. And, as the lungs breathe in fresh air, the blood helps itself to oxygen, and becomes bright red again. Then it goes back through a vein to the heart.

This drop of blood has now completed one round, and it is again ready for the heart to pump it once more through the body. This movement of the blood through the body is called its *circulation*.

The Heart and Exercise.—The more we do, the more food the parts of our bodies need. In running, walking, jumping, playing tag or ball, our bodies tire more quickly than when we stand or sit still. They use up their food sooner. They must get more food from the blood. The heart must beat faster to get blood enough to them. Then the blood will flow faster than usual. It will flow out toward

the surface of the body, and pass quickly through the blood vessels in the skin. The skin becomes reddened, and the body feels warm.

Oxygen and the Blood.—When the oxygen meets the waste matter in the blood, it makes just such a change in it as fire makes in fuel; it burns it. There is no flame and no smoke. You could not tell by looking at the blood that it was burning. But just as wood or coal, after it has been burning, becomes ashes, so the food material in the blood is changed by the burning started by the oxygen.

You know that the burning of any material sends out heat. It is the burning of the food in our bodies that heats our blood. The blood stores up its heat so well that it keeps the same temperature even when we are very hungry. We should have to go without food for many days before the blood would grow colder. Then, too, the blood is just as warm in December as it is in July. It is true that cold air on the skin makes us feel colder, and hot air makes us feel hotter. But that is because it is only the surface of the body, and not the inner parts, that can feel heat or cold. When we are exercising, and sending the blood flowing faster through the skin, we feel the warmth of the blood. When we sit still, and the blood flows more slowly

toward the skin, we feel cooler. The best way to keep warm is to eat well and to exercise properly, causing the blood to flow briskly.

Alcohol and the Heart. — All alcoholic drinks make the heart beat faster. This tires the heart, and finally weakens it so that it cannot do its best work. Alcohol also tends to harden the arteries so that they cannot stretch to let the blood flow through them. This causes the heart to pump harder.

Tobacco and the Heart. — Tobacco makes the heart flutter, or palpitate; that is, it makes the heart beat fast at one time and slow at another. This puts the whole body out of order, and may cause disease not only of the heart but also of the lungs, stomach, and other organs. The smoker can work neither so hard nor so long as the man who does not use tobacco.

XXX.—A WRITTEN REVIEW.

WRITE THESE SENTENCES.

1. The blood is a liquid that contains many round, red cells and some white cells.

2. The blood carries all kinds of food to all parts of the body.

3. The heart is a pump that keeps the blood moving.

4. The arteries are the tubes that take the blood away from the heart.

5. One large artery takes the blood from the heart to the lungs, to get oxygen from the air.

6. Another large artery takes the blood with its oxygen from the heart to the different smaller arteries that take it through the body.

7. The blood then flows from the smallest ends of the arteries through the capillaries, into the veins.

8. The blood that contains fresh oxygen is bright red.

9. The blood that contains the worn-out matter of the body is dark purplish red.

10. Alcoholic drinks and tobacco injure the heart and blood vessels.

XXXI.—SUNSHINE.

Why is it that we like the sunshine? Why is it that, after days of cloudy skies, the flowers brighten up with the first sunshine, and the cows and horses in the pasture eat more and frisk about as if they felt better in the sunny weather?

Rain is good for the earth; plants could not grow and streams would soon dry up without it. But too much moisture in the earth or the air is not healthful. Disease germs grow quickly where there is continued dampness. Darkness is restful for a little while; but only some insects and the little disease germs thrive in long continued darkness. Sunshine comes to clear the air and dry up unhealthful dampness, and give warmth and color to all living things.

Have you ever noticed a potato that had sprouted in a covered barrel or a dark cellar? Were the young stem and leaves growing out of the potato green or white? Probably they were white, or a very pale green, for the plant had been starving for light. It is light that keeps plants healthy. Without light, plants could not make food for us.

Then, we, too, should starve if there were not sunshine for the plants.

The leaves of plants are breathing all the time. In the sunshine they are breathing out oxygen, the gas that our blood needs so much, and that the plant does not need. But it is only in the light that the plant gives out oxygen. That is one reason why the air is so good to breathe on sunny days.

If there were no sunlight, so that plants did not grow, could you find enough to eat? Could you have milk? or eggs? or meat? If there were no plants, could you have a fire or clothes?

It is necessary, not only for our sight, but for our general health, that we should have well lighted rooms. Sometimes housekeepers close up their parlor and keep the curtains down, so that no sunlight will get in to fade the carpet and the furniture. When the door is opened, the air smells close and damp. The windows must be thrown open so that fresh air and sunlight may enter, before the room is fit to live in.

All the dark corners and closets in a house, from attic to cellar, should be kept very clean indeed; for in these places the sun cannot help us to drive away the insects and disease germs that grow quickly in the dark.

XXXII.—IF I WERE A SUNBEAM.

A MEMORY LESSON.

If I were a sunbeam
I know what I'd do:
I would seek white lilies
Rainy woodlands through;
I would steal among them,
Softest light I'd shed,
Until every lily
Raised its drooping head.

If I were a sunbeam
I know where I'd go:
Into lowliest hovels,
Dark with want and woe,
Till sad hearts looked upward,
I would shine and shine;
Then they'd think of heaven,
Their sweet home and mine.

—*Lucy Larcom.*

XXXIII.—BREATHING.

A man can live more than a month without solid food. Without water, one can live two or three days. Without air, one can live only a very few minutes. Why is it that air is so necessary to the body?

Why We Breathe.—You remember that unless the blood receives oxygen from the air, it cannot do its work. The food material in it will not be taken up by the different parts of the body. This is the reason, then, for breathing air into the body. You remember, too, that the blood, after it has visited all the parts of the body, is full of impurities. It must get rid of these. Some it can give to the air in the lungs. This impure air must not be kept in the lungs; and this is why we breathe air out of the body.

The heart does not send the impure blood, which it receives from the veins, back to the different parts of the body, with all the waste matter still in it. The blood must first be made pure. So it is sent to the lungs. In the lungs the fresh air we breathe gets very near to the dark impure blood,

and the blood takes in oxygen from it. At the same time, the blood gives up to the lungs some of its load of waste material. This the lungs breathe out.

When we breathe in air, we say that we *inhale* it. When we breathe out air, we say that we *exhale* it. This act of breathing in and breathing out, we call *respiration.*

How We Breathe.—Stand sidewise in front of a looking-glass; breathe out slowly all the air you can, and then breathe in slowly just as much air as you can. Do this several times and watch the outline of your body, as you see it in the glass. What do you see?

When you begin to breathe in, your chest begins to rise, and at the same time to stretch forward. Your stomach moves down and forward. When you begin to breathe out, your chest begins to sink down and to flatten in, and your stomach moves back again.

Now face the glass and spread your hands over your ribs on each side. Breathe in slowly and out slowly, as you did before. What do you see?

As you breathe in, your shoulders are rising a little; and your hands, pressed against your ribs, also are rising a little and are moving a little

farther apart to right and left. As you breathe out, your shoulders fall again, and your hands come down and nearer together. What is it, then, that happens in respiration?

The *chest* is the cavity, or box, below the shoulders and inside the ribs. It holds the lungs and the heart. When you inhale, the sides of the chest, the ribs, move up and out; the bony top moves up; and the bottom moves down. That is, the chest grows larger, as the lungs fill with air and require more space.

The bottom of the chest is a thin elastic sheet that stretches across the body, a little above the waist line. It is called the *diaphragm*. Above the diaphragm are the heart and the lungs. Just below the diaphragm are the stomach and the liver. As the diaphragm moves down to give the lungs more room, it presses down the stomach and the intestines beneath the stomach, so that they round out a little. When the lungs are emptied of air, the diaphragm rises again, and the stomach and intestines come back into place.

Take a tape measure and put it around your body close under your arms. Breathe out until your chest is flat, and measure the distance around your body. Breathe in as full and long a breath as

you can, and take your measure now. How many inches larger is your chest?

The Best Way to Breathe.—If you were asked, "Of what use is your nose?" would you say, "I can smell with it"? Do you remember, when you had a "cold in your head," and your nose was "stopped up," how difficult it was to breathe and how uncomfortable you felt? Did you realize then how important your nose is to breathe through?

It is much better to breathe through the nose than through the mouth. In the first place, if you breathe through your mouth, you take a great deal of air down into your lungs at once, and in cold weather this chills your throat and lungs. If you breathe through your nose, you take in less air at a time, and it is warmed a little before it reaches your throat. In the second place, the air that reaches your lungs by way of your nose is cleaner than the air that passes in through your mouth. Have you noticed the little hairs inside each nostril? These catch the dust in the air, if you breathe through your nose, so that the dust does not enter your throat and lungs.

(1) Always breathe in through the nose, not through the mouth. (2) When you are standing, stand erect; and when you are sitting, sit erect,

so that your chest may be as broad and deep as possible and you can take deep full breaths. (3) Take breathing exercises in the fresh air every day. Stand up straight with your hips back, and your chest swelled out, and your chin held up. Raise your arms stiffly from your sides until they point straight out to right and left from your shoulders; and as you do this draw in a deep full breath through your nose. Then let your hands down slowly, and at the same time let the air out slowly through your mouth. Sometimes let the air out quickly, and at the same time drop your arms suddenly. These are good exercises to strengthen your lungs and enlarge your chest. Taking deep, full breaths helps much to keep you healthy, bright, and happy.

XXXIV.—THE LUNGS AND THEIR CARE.

The Air Passages and the Lungs.—When you were reading about digestion, you learned that in front of the esophagus lies the *windpipe*, and that over the windpipe is a little cover that shuts down when you swallow, and keeps the food out. This windpipe receives the air that is breathed in through the nose and throat, and takes it down into the *lungs*. The windpipe is a stiff tube. It is made up of a number of hard rings joined one below the other.

If you were to turn the letter Y upside down, and were to draw a line around each branch of the ⅄ to look like a little bag, you could see how the windpipe enters the two bags of the *lungs*. The windpipe divides into two parts. One part is inside the right lung; the other part is inside the left lung. Inside each lung the pipe branches again into a great many small pipes, just as the limb of a tree branches into smaller branches, and then into little twigs. In a tree, at the end of each little twig is a leaf. In the lungs, at the end of each smallest branch of the pipe is a little *air sac*.

You have seen the little rubber "balloon" whistles that boys blow full of air? Well, each little air sac fills up with the air that is brought down the windpipe, just as a rubber whistle stretches out when it is blown into. When we breathe out, each air sac wrinkles together again, just as the balloon of the whistle will when the air goes out of it. When the chest is stretched to each side and up and down to give the lungs room, the air sacs fill with air. When the walls of the chest come back into place again, the air goes out of the air sacs.

Into the walls of each air sac run little blood vessels that are bringing dark blood to be purified. The blood gives out its bad gases, and takes in oxygen from the fresh air in the sac, and goes back to the heart, bright red. The heart gives it a fresh start, and it flows out through the body with its load of oxygen. Meanwhile, the lungs are only too anxious to get rid of the waste matter that the blood has unloaded into their air sacs. The air sacs shrink together and force the bad air out. We cannot hold our breath long. The bad air is poisonous to the body, and the air sacs will keep it a few seconds only.

Ventilation.—After air has been once breathed, it is no longer fit to breathe again. If the air in

the room has been partly used, you begin to feel dull and drowsy, and you may soon have a headache.

The air of all the rooms in which we live and work must often be changed. We must *ventilate* the rooms, so that fresh air may enter and the foul air pass out. If there are forty pupils in a schoolroom, forty bushels of fresh air should get into it every minute, and the same amount of used air should be driven out.

During recess all the pupils should go out of doors, or into an unused room, to fill their lungs full of fresh air, and also to give the teacher a chance to ventilate the schoolroom.

Fresh air should by all means get into your bedrooms. If the window is open just a little, you will have good air all night. If you get up in the morning with a headache, it is very likely because your bedroom was not well ventilated.

Bad Air.—We should never breathe bad air if we can help it. The air in cellars is bad, as you know, because of the dampness and lack of sunshine. Air from swamps and marshes is bad. Dusty air is bad, and people who have to work in dusty air—plasterers and coal miners and a good many factory workers—often become ill with diseases of the lungs and throat.

We try to keep the air in our schoolrooms just as clean as possible. We use good soft erasers on the blackboard, so that the chalk dust will not fly. The erasers are taken away and cleaned every day; and every day after school the chalk dust is taken out of the trough at the base of the blackboard. Before sweeping, the floor should be sprinkled with wet sawdust; for dry sweeping only drives the dust from one place to another.

Alcohol and the Lungs.—Alcohol thickens the walls of the air sacs in the lungs, so that they cannot stretch so easily. The person who continually takes alcoholic drinks finds it hard to take a full deep breath; and so his body does not get all the oxygen it needs.

XXXV.—THE SKIN AND THE KIDNEYS.

We have seen that the blood carries to the lungs some of the waste material of the body, and that we breathe this out as gas or air. But there are other waste substances in our bodies. Some of this waste is liquid, and two parts of the body get rid of it. These are the *skin* and the *kidneys*.

THE SKIN.

The skin is the soft, smooth covering of the body. It is so elastic that it always fits the body perfectly. If you take up a little fold of the skin on the back of your hand or under your chin, you can stretch it out like rubber. When you let go, the skin comes back to the size it was before.

The Two Skins.—In making a whistle from a piece of a branch or twig, have you noticed that a tree has two barks? There is an outer bark that is almost as thin as paper, if the tree is young; and there is an inner bark that fits tightly against the wood of the tree. The outer bark of a tree is dry, and some of it can be peeled off without doing the

tree much harm. But the inner bark is wet with the sap that flows through it; and if you strip off any of this, you do the tree great injury.

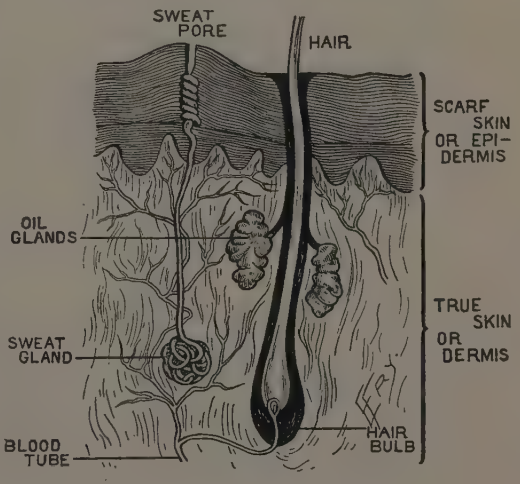
Our skin also has two layers. There is a thin outer skin, called the scarf skin; and close beneath it lies the true skin, through which little blood vessels run.

The Scarf Skin.—If you rub yourself hard with a bath towel, after bathing, a great deal of the scarf skin comes off in little flakes and rolls. The skin on the palms of our hands and the soles of our feet, although it is thicker than on some other parts, wears off very quickly, because it is constantly rubbing against something.

But, unless we have hurt the skin, the old scarf skin does not come off until after a new scarf skin has formed to take its place. The outer skin of the scalp flakes off easily, and lies around the roots of the hair as *dandruff*. It is the outer skin that puffs up if we blister ourselves by rubbing or burning. The scarf skin itself has no feeling. We can run a needle through it without its paining at all. The chief use of the scarf skin is to protect the true skin.

The Pigment.—The under side of the scarf skin contains little bits of coloring matter, called *pig-*

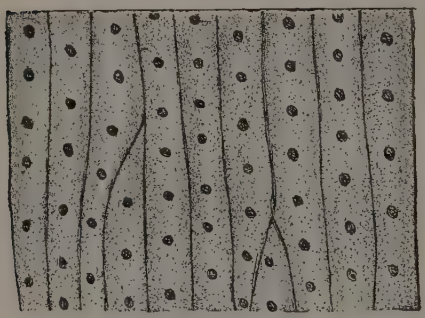
ment. This pigment is different in different persons; some have light complexions and some have dark. It is different in different races of people: in the skin of white persons, there is very little pigment; in that of Indians the pigment is of a reddish, or copper, color; in the skin of negroes, it is black. Where the pigment is not evenly spread out on the under surface of the scarf skin, but lies in patches, the skin looks *freckled.*



The True Skin.— It is the inner skin that does the work of carrying out waste matter. It is called the *true skin.* It is thicker and softer than the outer skin, just as the inner bark of a young tree is thicker and softer than the outer bark. If a needle pricks this inner skin, drops of blood appear; for it is filled with little blood vessels, just as the inner bark of the tree is filled with little tubes of sap. Then, too, pricking causes pain; for the true skin contains little nerves, by which we feel. In the

deeper portions of the skin are two kinds of sacs, or glands—the *sweat glands* and the *oil glands.*

The Sweat Glands and Pores.—If you look at the palm of your hand, you will see not only many coarse lines, but also many fine ridges. If you look at these fine ridges through a magnifying glass, you will see along each ridge a number of little dark spots. Each of these is the mouth of a *sweat tube* that runs in through the true skin. The inner end of the sweat tube is coiled up into a knot, called the *sweat gland.* The outer end is called a *pore.*



A portion of the Skin from the palm of the hand, very much enlarged, showing the openings of the pores.

The sweat glands are all the time taking from the blood water that is filled with waste matter. This passes through the sweat tubes and out of the pores, and spreads out and dries on the surface of the skin. Now you see why we should drink a great deal of water. The body must have plenty of liquid in which to carry off this waste material; and when we drink water we *perspire,* or give out moisture through the skin, more freely.

We have learned that when we have been eating heartily, or exercising, the blood flows out more quickly to the surface of the body. The skin becomes red. Now, as the blood flows through the little blood vessels in the true skin, and comes very near the air outside, it cools off. At the same time it gives the sweat glands a chance to take up more of the impure liquid than usual. If they take up a great deal, we see large drops of sweat on the forehead and chin, and other parts of the body.

In warm weather, too, we perspire more, because the heat of the air makes the pores of the skin open wider and the sweat glands work harder. It cools the skin and the blood in it to have this liquid pass out and dry on the skin, just as it cools the sidewalks in summer to have the rainwater dry up and pass off into the air. So perspiring helps to keep the blood from becoming too hot. That is, it helps to keep the body at its healthy, or normal, temperature of 98.4 degrees.

When we have been sitting still too long, or when the body is not working hard to digest food, the blood flows more slowly through the skin, the sweat glands take up the impure liquid more slowly, and we perspire but little. In cold weather the body must keep itself warm by holding in its natural

heat. Again the skin helps the body to keep its right temperature. The pores of the skin close up a little, as the cold air reaches them. This keeps us from perspiring freely; thus the blood loses less heat.

Hair.—There are many little pockets in the true skin, and from each of these little pockets grows a hair. In the skin of birds these little pockets are larger, and from them grow feathers instead of hair. Many of the hairs on our bodies are so tiny that we do not notice them at all; but there are hairs more or less close together on every part of the skin except the soles of the feet and the palms of the hands. The hair helps to protect the true skin. Why do we not need it so much on these parts of our hands and feet?

Oil Glands.—In the true skin there are also many little *oil glands*. These are usually near the root of a hair; and they empty their oil into the little pocket, or sac, in which the hair has its root. The hair takes up this oil, which is better for it than any oil the barber can use. If the skin is healthy, this natural oil will keep the hair smooth and glossy. If an oil gland in any part of the skin becomes stopped up, a *pimple* forms. The stoppage of several oil glands close together causes a *boil*.

Nails.—The nails on the fingers and toes come, like the hair, out of little pockets in the true skin. And like the skin and the hair, they grow and keep themselves repaired. The back of the fingers and toes, under the nail, is called the *quick*. This is very sensitive, and easily hurt if the nail is cut open or cut too close. Of what use are the nails?

Summary.—The skin consists of two parts: the outer, or scarf, skin; and the inner, or true, skin.

The scarf skin, aided by the hair, protects the true skin.

The true skin contains nerves, blood vessels, sweat glands and tubes, oil glands, and the hair and nail pockets.

The skin of the body (1) protects it; (2) carries off waste matter; (3) regulates the temperature of the body.

THE KIDNEYS.

The impurities and waste matter that are not given off by the lungs and the skin are collected as a liquid in the kidneys.

The Form of the Kidneys.—The kidneys are two bean-shaped bodies. Each is a little larger than half the size of the closed fist. One lies on each side of the back, at about the waist line.

Each kidney is full of little tubes, very much like the tubes in the skin. Suppose you could take a roll of skin and turn it outside in, with all the pores opening into a hollow at the middle, and all the little glands on the outside. That would be very much like a kidney.

The Work of the Kidneys.—The work of the kidneys is like that of the skin. The glands on the outside of the kidneys are all the time drawing poisonous matter from the blood that flows by them. They are taking this waste liquid through their tubes, and are pouring it out into the hollow center of the kidney, ready to pass out of the body.

XXXVI.—THE CARE OF THE SKIN.

There are 3,000,000 tiny sweat tubes, pouring out waste matter upon the surface of the skin. If we do not keep the skin clean, the pores will become clogged, and this waste will be kept within the body. Then the lungs and the kidneys will have more than their share of work to do and may get out of order. The skin will not look well and will have a very unpleasant odor.

Bathing.—To keep the skin healthy, the entire body should be bathed at least once or twice a week. If it is not convenient to take a tub bath, a sponge bath may take its place. Bathing should be followed by a quick rubbing, until the skin is aglow.

We should not bathe in water that is too cold or too hot; nor when we are very tired; nor just before or just after eating a hearty meal.

Swimming.—Many people, especially boys, would rather take a bath by going in swimming. This is the finest kind of exercise, if the swimmer is careful and does not stay in the water too long. It is dangerous for any one to go in when too tired, or too

warm, or directly after eating. He may be seized with cramps while in the water, and drown.

A Cold.—If you are very warm and sit down in a draught, you may "catch cold." That is, you will cool the body too suddenly.

The little blood vessels in the skin become smaller for a while, so that the blood will not flow through them as it should, but will be crowded back into the inner parts of the body.

The sweat pores of the skin, too, close up when they are chilled suddenly. When this happens, the waste matter cannot pass out, and the kidneys have to do extra work, and may get out of order.

Alcohol and the Skin.—Drinking alcohol enlarges the little blood vessels in the skin, so that more blood flows into them. Since the blood cools at the surface of the body, drinking liquor makes the body colder. It also makes the skin red and coarse.

As alcohol tears down the body instead of building it up, it makes more waste material for the skin and the kidneys to carry away from the blood. The sweat glands have to work harder, and the kidneys may become so affected that they cannot work.

The Care of the Nails.—Both the finger nails and the toe nails should be kept clean, as should every other part of the body. The black dirt under the

ends of the nails often contains active little germs. Sickness may be carried from these into the body, or from one person to another.

If there is anything more slovenly than black nails, it is bitten, shapeless nails. Biting the nails is a bad habit. It may lead to very bad sores on the finger ends, and it may also carry disease into the mouth. There is no better mark of tidiness about a boy or a girl, than clean, well-shaped finger nails.

Hang-Nails.—Sometimes a little narrow strip of skin near the root of the nail is torn up and hangs by one end. This is called a *hang-nail*, and it is very sore and painful. Biting off hang-nails makes them much worse. They should be cut off close to the skin with sharp scissors.

The Care of the Hair.—If the pores about the roots of the hair become clogged with waste matter from the skin, or with dust from outside, the hair is likely to fall out; and it may lose its color or luster if the little oil glands are kept from working properly. The hair so easily catches dust and dirt that it should be frequently washed, or shampooed, with good soap and soft water.

XXXVII.—A PICTURE LESSON.

Write a short composition upon "The Care of the Hair."

THE VILLAGE BARBER. N. GYSIS.

XXXVIII.—CLOTHING.

We must be careful to clothe ourselves so that we shall keep the body warm enough, and not harm any part of it by the kind of clothes we wear, or by the way we wear them.

Clothing for Warmth.—Clothing does not make bodily heat; but it prevents the bodily heat from passing off into the air, and so makes it easier for the body to keep itself warm. In cold weather there is as much danger in wearing too much clothing, as in wearing too little. Too much clothing over any part of the body overheats it and makes it tender, so that it becomes very quickly chilled when next it is exposed. Sore throat is often caused by needlessly wearing a muffler about the neck.

Woolen clothing worn next to the skin absorbs the perspiration more readily and keeps the body from becoming quickly chilled.

Harmful Clothing.—Tight clothing always harms. There is no unused space in the human body. A girl needs just as much room for her liver, stomach, and lungs as a boy does. Tight clothing deforms the liver and squeezes up the lungs and crowds the

stomach out of place. Then the blood cannot flow freely through the blood vessels in these parts, and none of the organs can work properly.

Flat-heeled shoes are better for both health and looks than very high-heeled ones. High heels tip up the foot so that the wearer cannot walk properly. Tight shoes may cause hard places, or corns, and painful swellings on the feet. Shoes that are much too loose will slip and rub against the feet, and also cause corns.

Elastic garters about the knees, if they are too tight, press upon the blood vessels and hinder the circulation. It is better to wear supporters fastened at the waist or the shoulders.

Clean Clothes.—Much of the dirt and perspiration of our bodies clings to our clothes. Our clothes must be washed clean as well as our bodies. The clothes we wear through the day should be dried and aired at night, just as the bed clothes and the bedroom should be well aired during the day.

XXXIX.—THE FRAMEWORK OF THE BODY.

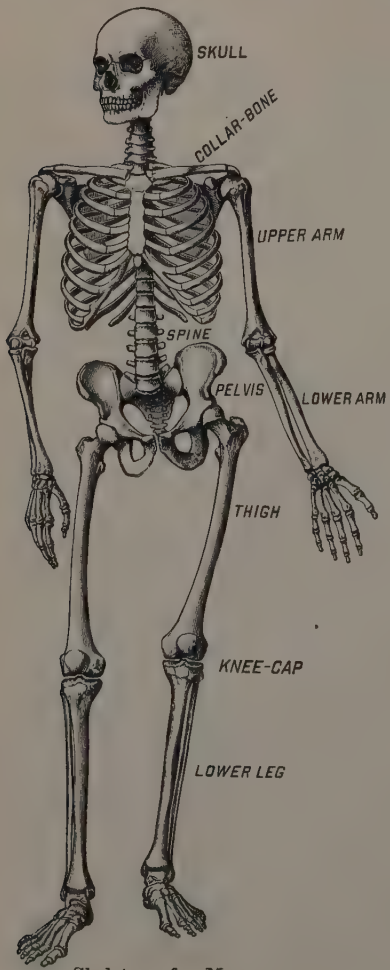
We could not build a house of plaster and wall paper alone. We must have a good strong framework of iron or wooden posts and beams. Our bodies have a stiff, strong framework made of many bones, closely joined and fitted together. These bones make the body firm and strong; they give it its shape and hold the organs of the body in place.

The Skeleton.—All the bones of the body, fitted together, each bone in its proper place, make up the *skeleton*. There are over two hundred of these bones, of different shapes and sizes.

If you lean over and feel down the middle of your back, from your neck to a few inches below your waist line, you will feel what seems to be a bone that is in humps or ridges. This is not one bone. It is a line of twenty-four small bones fastened together, and each of the bones makes one of the humps you feel. This column of small bones is called the *backbone*, or *spine*.

If you take a full breath and run your fingers up and down your sides, you can feel your ribs. There are twenty-four ribs, twelve on each side.

All of these ribs are fastened to the backbone and curve around to the front. The upper ribs on each side enclose the cavity called the chest, and protect the heart and lungs.



Skeleton of a Man.

At the upper end of the backbone is the *skull.* This is a hollow bony shell that protects the brain and the inner parts of the eyes, ears, nose, and mouth.

The bones of the arms are fitted to the trunk at the shoulders; the bones of the legs are fitted to the trunk at the hips. The arms and the legs are much alike. In the upper part of each there is one bone; and in the lower part, below the elbow and below the knee, there are two bones side by side. The hand joins the arm at the wrist; the foot joins the leg at the

ankle. Both hands and feet are made of many little bones, so that they are easily bent.

The Strength of the Bones.—A bone is a tube filled with a soft fat, called *marrow*. Because a bone is hollow, it is, like the frame of a bicycle, less likely to break and much lighter. A healthy bone is twice as strong as an oak stick of the same size. As we grow older, our bones grow harder and stronger. If very young children are stood upon their feet too soon, their leg-bones bend, and they become bow-legged.

Fractures.—Though the bones are very strong and can bend a little, they do sometimes break. A break in a bone is called a *fracture*. The bone must be "set" as soon as possible. It must be bandaged to a splint to hold it firmly in position, and must be kept this way until it repairs itself.

The Joints.—The places at which the bones of the skeleton are fastened together are called *joints*. The fastenings are tough bands, called *ligaments*. These keep the bones properly fitted together, but do not prevent our turning them in different directions. We can bend our fingers and toes at the joints called *knuckles;* we can bend our arms at the *elbows*, and our legs at the *knees*. At some of the joints the bones are so fitted together that one of

them can be moved in any direction. You can swing your arm in a circle from the shoulder joint.

Dislocations.—Although the bones are well fitted and are strapped together by ligaments, yet a bone may be pushed out of joint, or *dislocated.* When this occurs, the bone should be put back in place at once by a surgeon, and firmly bandaged.

Sprains.—Sometimes the ligaments that hold the bones together at a joint are stretched too far, or even torn, by a sudden twisting or turning of the bones. If you turn your foot over suddenly on its side, and bear your weight down on it, you may stretch too far the ligaments of the ankle. The flesh about the joint becomes very tender and painful. Such an injury is called a *sprain.* When a joint is sprained, it should be kept in either hot or ice-cold water, or be wrapped in hot, wet cloths, or an ice-bag, for an hour, and should not be used until most of the pain has gone.

A Well-Shaped Body.—While young, your bones very easily take the shape you give them, so you should grow into habits of standing and sitting in ways to make your body well-shaped and graceful.

In standing, push your hips back as far as you can. When you hold your hips in this way, the rest of your body takes care of itself; your head is

up, your chest held out, your knees are firm and straight.

In sitting, too, you should hold yourself erect. Do not slide forward in your seat and curve your spine so that you are really sitting upon the lower part of your back. If you do this, your head hangs forward, your shoulders are round, and your chest is so squeezed in that there is not room enough in it for all the air you need to breathe.

In sleeping, you should not lie with your head raised too high on a thick pillow; for this bends your neck and shoulders into an unnatural position

Many boys and girls have misshapen and deformed bodies because they have not had school seats and desks to fit them. If the school seat is too low or the desk too high, the pupil's right shoulder is raised so much that sitting in this position will soon deform his spine. If the seat is too high or the desk too low, the pupil bends over and becomes round shouldered.

Try to cure yourself of any bad habits of standing or sitting that you may have, such as standing on one foot, walking in a slovenly way, or twisting yourself into awkward positions. We can not all be beautiful of face, but most of us can have strong, graceful bodies, if we are careful in using them.

XL.—THE MUSCLES.

What do you do when you ask one of your schoolmates to "feel your muscle"? You bend your arm at the elbow and bring your forearm up as firmly and as far as you can. And what is there to "feel"? There is a bunch under the skin at the front of your upper arm; and the harder the bunch is, the prouder you are of it. That is *muscle*, and you are rightly proud of being strong.

The Muscles of the Arm, when the arm is extended.

How the Muscles Act.—A *muscle* is made of little tough strings, grouped into a bundle. When you started to bend your elbow, each of the tiny threads of the muscle bundle began to grow shorter and thicker, just as a stretched rubber thread becomes thicker if we let go of one end so that it can go back to its original size. That is, the muscle was

doing its work by shortening, or *contracting*. When a muscle contracts, it pulls on the part of the body to which it is attached and makes it move.

The muscles that move the bones are attached to the bones by cords called tendons. In the picture you can see the tendons that fasten one end of the muscle to the shoulder bone, and the tendon that fastens the other end to the bone of the forearm.

The Muscles of the Arm contracted to bend it.

Each bundle of muscle causes only one kind of motion; that is, a motion in one direction. To move the part of the body in another direction, another bundle must shorten up and pull the part with it, while the first bundle lengthens out again.

A muscle cannot be kept shortened any great length of time. If you hold your arm bent as long as you possibly can, it feels tired, and finally pains. In many of the movements of the body, such as walking, one set of muscles acts while the other set rests, or makes ready to act again. This is the reason

that it is not so tiresome to walk one hour as it is to stand perfectly still for a much shorter time.

No part of the body could move without the help of muscle. The walls of the stomach are muscles, which move and churn the food about. The walls of the heart are muscles; their movement pumps the blood through the heart. The esophagus and the intestines are muscles; as one set of muscles after another contracts, the food is pushed along through the tube. The bony framework, or skeleton, of the body is covered with muscles that move it about. The muscles form one-half of the weight of the whole human body, and in it there are more than five hundred. What we usually call "flesh" is chiefly muscle and fat. The lean part of beef is the animal's muscle.

Clasp your left hand tightly around your right arm just below the elbow. The muscles that you are pressing control the movements of your fingers. If you move the fingers of your right hand, you can feel the muscles moving.

Look at the back of your hand as you move your fingers. You can see the strong tendons that join the muscles in your forearm to your finger bones.

Your feet do not start to walk, nor your hands

to move, unless you wish them to do so. When you were a baby you had to learn to use the muscles of your hands and feet. No one, however, taught your heart to beat, or the walls of your stomach to move; yet the muscles of your heart and stomach are working, whether you think about them or not. In fact, unless they pain you, you hardly know that they are working.

Besides these two kinds of muscles, we have still a third kind. These are the muscles that do their work without orders from us, but which will obey us for a short time. In breathing, the muscles of our chests move without our noticing what they do, yet we can hold them still for a moment.

Alcohol and the Muscles.—If you wish to have strong muscles, never use tobacco or alcohol. Alcohol keeps food from getting into the muscles, and changes some of the muscle substance into fat. There is no strength in fat.

The athlete knows that if he drinks alcohol, he will weaken the muscles of his heart. He must have a strong heart if he is to run or jump, or play games in which the man who can hold out longest wins. Hard or quick exercise would strain a weak heart and make it stop beating. Then, too, if the muscles of the heart are weakened so that they

cannot contract quickly and force the blood out through the body as they should, the body will not be properly nourished.

Exercise and fresh air, good food and pure water, make the muscles strong.

XLI.—EXERCISE.

The weakest person can do something to make himself stronger. Some very strong men were feeble when they were boys.

How to Make the Muscles Strong.—By using a muscle you can make it grow stronger. The arm we use the more is stronger than the other arm. The arms of a blacksmith or of a carpenter are much stronger than the arms of persons who do not exercise.

Boys and girls who live where they can play and work out of doors in gardens and fields are very fortunate. But even in the city there are many kinds of exercise that one can take; and city boys and girls should walk a great deal and play in the parks and other outdoor playgrounds when they can.

The muscles get their food from the blood. Exercise causes fresh blood to flow more quickly to the muscles; and in this way it brings them more food, so that they grow larger and stronger.

How to Exercise.—Exercising while you are young does much more good than it will when you are older. But you should not exercise so that you

overtax your strength. A little five-year-old child should not try to take the same kinds of exercise that a boy or a girl of fifteen would take. Such kinds of exercise are not suited to his size and strength. Too hard exercise will keep him from growing, instead of helping him to grow.

A little regular work about the house and garden is the best kind of exercise for the muscles. There is satisfaction in doing well and finishing a piece of work, and we exercise all the more heartily if we have a purpose in moving about.

The exercise that you most enjoy will, as a rule, do you most good. Happiness leads to health, just as health causes happiness.

Girls should play and romp with the same freedom that boys do. Health is as necessary to a girl as it is to a boy, and perfect health is impossible without good exercise.

It is a good thing to exercise for a few minutes every day in your own room, with the windows open so that you can breathe deep breaths of fresh air. Go through the breathing exercises and other exercises for your body that you have learned at school.

Games.—The best exercises for children between six and nine years are easy games in which they

move about a great deal, such as "Ring-a-Round-a-Rosy," "London Bridge Is Falling Down," "Klondike," "Blackman," "Blindman's Buff," and some of the simpler games of tag.

Such games as "Race-Tag," and "Prisoner's Base" are good for children between nine and fourteen years of age. Simple ball games, such as "One Old Cat," should be played when a boy is from nine to eleven years old. When he reaches twelve he should begin to play such games as shinny, polo, hockey, and baseball.

The boy on a farm takes plenty of exercise out of doors. He is laying the foundations of a healthy body for his manhood. But his exercise comes in the form of work, and "All work and no play makes Jack a dull boy." Games do something for the growing boy and girl that work alone cannot do.

Games train the mind as well as the body. Games and plays help you to learn your lessons, for they teach you to think quickly, and to decide quickly, as well as to act quickly. In baseball a boy develops judgment, skill, daring, and courage. One cannot learn to tell balls and strikes without judgment. He must use skill in batting. It takes daring to try to steal a base, when pitcher and catcher are wide awake; and courage is certainly

needed when one is called upon to "slide to the home plate." Learning to swim or skate takes grit.

Bicycling is good exercise, chiefly because it has to be taken out of doors. There is danger of overtaxing the heart if one rides too far or too fast. Tennis is a fine game, suitable for girls as well as boys. It develops every muscle of the body. Football is a game of brains as well as muscle. But football should not be played by young, undeveloped, untrained boys, for the same reason that very little children should not climb trees. There is great risk of being crippled for life in either case.

Walking is one of the best and most natural forms of exercise. Walk erect, knees straight, head well up, chin in, eyes to the front, looking the world in the face. Running and jumping also are healthful to those for whom they are not too violent.

By all means learn to use tools. You will be getting exercise and knowledge at the same time.

XLII.—A PICTURE LESSON.

Write a description of a football game that you may have seen.

W. H. OVEREND.

FOOTBALL MATCH.

XLIII.—REST.

The Need of Rest.—If you take a long walk, or stand a long time to watch a parade, your legs and feet will become very tired. But you could sit down afterwards and enjoy sewing or using tools or practising on the piano; for you would be resting the tired muscles of your feet and legs and using a fresh set of muscles—those of your hands and arms.

If you use any muscles too long, they not only become very tired, they also grow weaker. They wear away faster than they can be repaired by the blood. The children who quit school and do heavy work in a store, a factory, a mill, or a mine, do not grow to their full size or strength. And one reason is that they overwork; their muscles become very tired, and their growth is slow.

How to Rest.—If any muscles have been exercised until they are a little tired, they should be rested. But we need not be idle to be resting. We can rest one part of our bodies while we use another part. If the mind is tired, we can rest it best by taking some brisk exercise of the body. This is the reason why recesses are given in schools. A recess should

not be spent in the schoolroom, but should be used by both boys and girls in free play out of doors.

Sleep.—Sleep is the only form of complete and perfect rest. A child that does not sleep soundly the proper number of hours is not well. The average amount of sleep required at

4 years of age is 12 hours;
7 years of age is 11 hours;
9 years of age is 10½ hours;
10–12 years of age is 10 hours;
12–14 years of age is 9 hours.

You have learned that if you eat a hearty meal at night, just before going to sleep, you cannot properly digest it. Poor digestion often keeps one half awake.

Children should never go to bed hungry. When hungry, you cannot go to sleep easily, or sleep soundly. Instead of going to bed hungry, take some easily digested food, such as bread and milk, crackers, or milk alone.

Overwork, excitement, or the reading of horrible or exciting tales just before bedtime, is likely to keep you awake. To drop asleep quickly, you should go to bed at the same time every evening.

Poorly ventilated and overheated bedrooms prevent sleep and cause headaches. The room in which

you sleep should be cool, and the window should never be shut tight.

Young boys and girls should not go often to night entertainments, if they are to remain healthy and do the best school work. If they are up late at night, they come to school the next day tired, when they should be rested.

During sleep the body gets back its strength. The rest of mind and body that comes with sleep cannot be had in any other way.

When he is a little chap,
We call him *Nap.*
When he somewhat older grows,
We call him *Doze.*
When his age by hours we number,
We call him *Slumber.*

—*John B. Tabb.*

"Sleep is the golden chain that ties health and our bodies together."—*Dekker.*

XLIV.—WYNKEN, BLYNKEN, AND NOD.

A MEMORY LESSON.

Wynken, Blynken, and Nod one night
Sailed off in a wooden shoe—
Sailed on a river of crystal light,
Into a sea of dew.
"Where are you going, and what do you wish?"
The old moon asked the three.
"We have come to fish for the herring-fish
That live in this beautiful sea;
Nets of silver and gold have we!"
Said Wynken,
Blynken,
And Nod.

The old moon laughed and sang a song,
As they rocked in the wooden shoe,
And the wind that sped them all night long
Ruffled the waves of dew.
The little stars were the herring-fish
That lived in that beautiful sea—
"Now cast your nets wherever you wish—
Never afeared are we";
So cried the stars to the fishermen three:
Wynken,
Blynken,
And Nod.

All night long their nets they threw
To the stars in the twinkling foam;
Then down from the skies came the wooden shoe,
Bringing the fishermen home.
'T was all so pretty a sail it seemed
As if it could not be,
And some folks thought 't was a dream they'd dreamed,
Of sailing that beautiful sea—
But I shall name you the fishermen three:
Wynken,
Blynken,
And Nod.

Wynken and Blynken are two little eyes,
And Nod is a little head;
And the wooden shoe that sailed the skies
Is a wee one's trundle-bed.
So shut your eyes while mother sings
Of wonderful sights that be,
And you shall see the beautiful things
As you rock in the misty sea,
Where the old shoe rocked the fishermen three:
Wynken,
Blynken,
And Nod.

—*Eugene Field.*

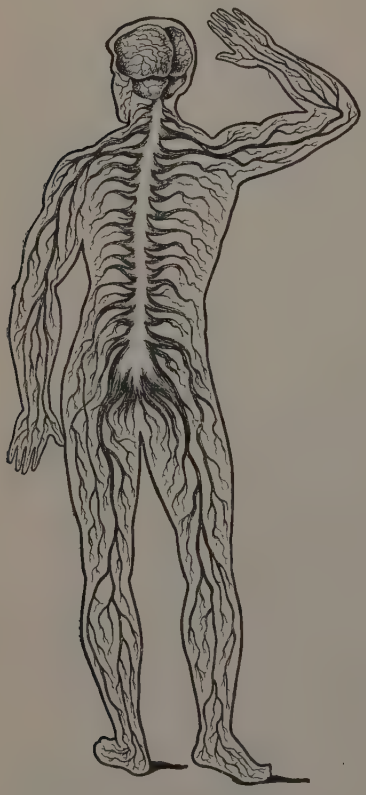
Note.—By permission, from "With Trumpet and Drum." Copyright, 1892. Published by Charles Scribner's Sons.

XLV.—THE BRAIN AND NERVES.

The Nervous System.—Your heart, your lungs, and your organs of digestion do their work whether you think about them or not. Your arms and legs, lips, tongue, and other members, you can move as you wish; and they do not make these movements unless you wish them to. Something must control and direct the different parts of the body so that they act at the proper time and in the right way. That something is the *brain.* The brain itself is in the skull, but it is connected with every part of the body by little threadlike *nerves.* Over these nerves it receives messages from the rest of the body and sends out answers, as we receive and send messages by telegraph or telephone. The brain and the nerves together are called the *Nervous System.*

How the Brain Answers.—You touch your hand to a hot stove. At once a message is sent along the nerves from your hand to your brain. Quick as a flash the brain sends a message down the nerves to the muscles of your arm and hand. It makes the muscles contract and so pull your hand away

from the hot stove. But this is done so quickly that you say you do it "without thinking."



The Nervous System of a Man.

When, however, you are drawing a picture, your brain guides your hand only as you wish it to. You see the paper and the pencil and the shape you wish to copy; but you do not begin to draw the line until your brain orders the muscles of your hand to move.

Memory and Thinking.— The brain keeps a record of news that it gathers. You remember your last lesson, do you not? Why? Because your last lesson is recorded in your brain. The brain's ability to keep such records and to use them when it wishes, we call *memory*. It is with our brains, also, that we think. The power to think and to reason makes us different from the lower animals.

What the Brain Can Do.—The brain can receive news of the outside world or of the body itself. It can direct the body how to move and how to take care of itself. It can keep a record of the news it gets and can store it up as memories. It can use these memories over again in different ways so that it can think out new things.

Habit and the Brain.—The first time that you tried to braid your own hair or to tie your own neck-tie, you found it hard to do. You had to teach your fingers how to move to make the braid or the bow; but if you have done either of these things often, you are now able to do it nicely, without much thought or care. Why? Because when your brain has given out the same directions to your muscles many times, it can do so again without effort. That is, you do not have to think about what you are doing; you act from *habit.*

Habits are hard to change. Therefore we should be very careful what habits we form. The more good habits we have, the happier and healthier we can be. We should have habits of getting up at the same time every morning, of eating at the same time every day, of going to bed at the same time every evening. We should have habits of standing well and sitting well. We should have the habit

of studying hard, and of doing cheerfully what we know we ought to do.

The Care of the Brain.—We exercise our muscles so that our bodies will grow larger and stronger and be able to move quickly and accurately. So it is with the brain. Unless the brain is exercised in thinking, it will not think accurately or quickly. We go to school not only to learn the facts in our books, but to train our brains to think. We should form habits of attention and of quick and careful thinking, to make our brains strong and useful.

Lack of food and lack of exercise, and especially lack of sleep, harm the brain. When the brain is growing fast, as children's brains are, they should have the best care that can be given them. Children should never have headaches. A headache is the brain's warning that something is wrong.

Alcohol and tobacco affect the nerves and the muscles, so that the brain cannot control them. Moreover, drinking alcohol hurts the brain itself, by breaking down the substance of which the brain is made.

XLVI.—THE SENSES.

In how many ways do you know about the world around you? You see the trees and know their color; you hear your mother's voice, and know its sound; you eat an orange, and know its taste; you smell a flower, and know its odor; you touch a piece of wood, and can tell whether it is smooth or rough. We call these five different ways of gaining knowledge the *five senses.*

Besides these "five senses," that tell us chiefly about things outside of ourselves, we have three other senses that are very important. One is the sense of *hunger and thirst*; one is the sense of *heat and cold*; and the other is the sense of *pain.*

When our body needs more food, nerves from the stomach take a message to the brain to tell it so. When the body is too hot or too cold, nerves from the skin send the message to the brain. Every pain that we have is a signal carried to the brain by the nerves, telling it that the body is being harmed.

Sight.—We see with our eyes. The eye is a hollow ball filled with a clear fluid. Look at the eye of some one. You will see a little black spot in

the center. This is called the *pupil* of the eye. The pupil is a hole, through which you see the dark inside of the eye. Around the pupil is a rim of color, called the *iris*. The rest of the *eye-ball* is white.

Back in the dark hollow of the eye are the ends of the nerve that carries the message of sight to the brain. This nerve is called the *optic nerve*. The light that comes through the pupil of the eye gives the nerve the message. When the message has reached the brain, we see.

The eye is so delicate and so easily hurt, that it is very carefully protected. It is set upon a soft cushion of fat in a bony socket of the skull. The eyebrow above keeps the water, or perspiration, on the forehead from running into the eye. The eye-lid protects the eye from dust and too strong light. The nose helps to protect the eye from blows or jars from the front or side.

The *tear gland* is just above the eye, at the outer side. It lets out a salty water very slowly. This water flows across the eye-ball and down a tiny tube, the *tear duct*, into the nose. Tears keep the eye-ball clean.

Care of the Eyes.—If the whole body is weak and the health poor, the eyes also are likely to be

weak. We can keep our eyesight strong by taking care of the health of our whole bodies, and by not doing the things that hurt our eyes. A little carelessness may bring us much pain, and even blindness, for the eyes are easily strained.

IN SCHOOL.

1. Sit upright; sit squarely in your seat.
2. Keep your eyes at least a foot from your work.
3. Write on a sloping, not a flat desk.
4. Read with your book well up; do not lay it down flat.
5. Do not read very small print.
6. Do not work in a dim light.
7. Do not work with bright sunlight on the page.
8. If you cannot see your work properly, tell your teacher.

OUT OF SCHOOL.

1. Do not read lying down.
2. Do not read by twilight, nor by a poor light, nor when the eyes are tired.
3. Do not face the light in reading.
4. Do not look steadily at the sun nor at any very bright light.
5. Do not read or study much before breakfast when your stomach is empty.
6. When your eyes feel tired after reading for a time, rest them by looking at objects at a distance.

Hearing.—We hear with our ears. Usually, by "the ears," we mean the curved and folded part that stands out a little from each side of the skull. But this is only the *outer* ear, which helps to gather the sound for the real, or *inner*, ear to take. The hole into which you can run your little finger, is the passage from the outer ear to the inner parts. Right across the passage is stretched a thin substance, much as the head of a drum is stretched. It is called the *drum* of the ear.

When a person speaks or sings, or the strings of a piano or a violin are moved in playing it, or a bell is struck, the air near them is moved. The air does not move much, as a breeze, but in tiny ripples or waves. These waves are so small that we cannot feel them; but the drum of the ear is so delicate that it is jarred by the tiny air waves. This movement of little waves finally reaches the ends of a nerve in the inner ear, called the *auditory nerve.* This nerve carries the message to the brain, and we hear sound.

Care of the Ears.—Nature cares for our ears, as she does for our eyes. There are tiny hairs inside the ear passage, to keep dust from going in. There is also a liquid to keep the ear-drum moist and to protect it. This liquid is so bitter and sticky that

insects will not go far into the ear. In the outer part of the ear passage, this liquid dries into a wax, which also catches dust and dirt.

The ear should be cleansed every day with soap and water and a soft cloth. Never put anything sharp or hard into the ear. Remember that the ear-drum is very delicate, and that, if you injure it, you may become deaf.

Taste.—We taste by means of the *taste-buds* in the tongue and the lining of the mouth. Taste is a very useful sense. It tells us whether food is fresh or spoiled, and whether it is spiced or seasoned to our liking. In this way it helps us to know what is good and what is harmful for us, though we cannot depend altogether on the sense of taste. We may like a harmful thing and dislike a wholesome one. But we can always learn to like wholesome food; and it is much better and pleasanter for us if we try to like all the good foods that are given us to eat.

Smell.—We smell through the *nose*. The nerves that carry messages of smell to the brain end in the lining of the upper part of the nose. When you have a cold, and your nose is "stopped up," odors cannot reach the nerve ends, and no messages of smell reach the brain. At the same time there is probably very little that you can taste. This is

because most of what we call "taste" is taste and smell together. We get the odor of food while we are eating it, and so we do not know what part of the flavor is taste and what is smell. The sense of smell will sometimes tell us when the air is unfit for breathing.

Touch.—We touch or "feel" by means of the *true skin.* Nerves that end in the true skin let the brain know whether the object they touch is sharp or blunt, smooth or rough, soft or hard.

The nerves of touch are everywhere through the skin. But some parts of the skin are not so sensitive as others. The tip of the tongue and the tips of the fingers are most sensitive. You could tell the difference between the handle of a nail brush and the brush itself just as well through the nerves of your back as through the nerves of your hands. But probably the nerves of your back would not find any difference between a fine towel and one a little coarser. Yet your fingers could tell the difference, easily.

The sense of touch can be educated, as can all the senses. Persons who cannot see can train their finger tips to read the books for the blind,which are made with letters raised above the page.

XLVII.—FIRST AID TO THE INJURED.

A little knowledge of what is best to be done in case of accident may save life. Accidents will happen, and it is well to know what to do until the doctor comes.

Fainting.—This usually occurs because the room is overheated or poorly ventilated. Place the patient where he can get plenty of air, on his back, with his head low, no pillows of any kind being used. Loosen all the clothing about the neck. Keep the crowd back. Sprinkle a little cold water on the face. Never pour anything down the throat of an unconscious patient, for it may cause him to choke to death.

Foreign Bodies in the Eye.—Cinders and dust get into the eye. This causes severe pain. Rubbing the eye will make matters worse. Open the eye, and perhaps tears will wash out the offending particle. A drop of sweet oil or a grain of flaxseed put into the eye will afford relief. Or draw the upper lid down over the under one; the lashes of the under lid may remove the cause of irritation. A still better method is to place a match or a wooden toothpick on top of the eyelid, then to catch hold of the lashes and turn the lid back. The dirt or cinder will, in all probability, be seen clinging to the under surface of the lid, and can be easily removed with the corner of a handkerchief.

Bleeding from the Nose.—This is quite a common occurrence among children and, as a rule, is not alarming. Place the patient erect in a chair, or have him stand, stretching both hands high above the head. Press the tip of the nose between the finger and the thumb, or press the upper lip. Put a piece of ice or a cold cloth at the back of the neck. Loosen the collar. Also apply cold water to the nose and forehead. If the bleeding continues,

the patient should snuff into the nose cold water containing a little salt or soda.

Bleeding from an Artery.—If the blood comes in jets or spurts it is an artery that is bleeding. This may prove serious. Fortunately, at most parts of the body the arteries are deeply buried in the flesh. A severed artery calls for prompt action. Put firm pressure upon the bleeding part *between the wound and the heart.* The pressure is best applied, in case the wound is in the arm or the leg, by taking a folded handkerchief, tying a knot in its center, and placing this knot over the artery. A short stick or a stone may be tied in the knot, to press against the artery. Tie the handkerchief loosely round the limb, but with a good knot. Place a stick under the bandage and twist it round and round until the bleeding stops.

Bleeding from the Veins.—The patient should lie quietly. Raise the bleeding member, and wash the wound with cold or hot, but *clean*, water. Then tie a pad of soft clean linen so as to press firmly upon the injury.

Burns.—The best application for a burn is a tablespoonful of common cooking soda to a glass of water. Afterwards apply vaseline. A mixture of equal parts of linseed oil and lime water is excellent for dressing burns. Apply loosely with cotton.

Bee Stings.—The stings of bees, wasps, hornets, and yellow-jackets are relieved by first bathing the sting in hot water and squeezing out the poison. Then use the solution of soda mentioned in the preceding paragraph. This same treatment will relieve also in the case of nettle stings. Ammonia, too, is excellent for these injuries, and for mosquito bites. All boys know

that binding mud over a sting gives relief. Be careful always to pull out the "stinger" before treatment is applied.

Burning Clothing.—Quick work is necessary when a person's clothes catch fire, for in a very few minutes he will be so severely burned that he will die. Place such a person flat on the ground immediately; smother the flames with a coat, shawl, blanket, piece of carpet, or anything at hand. If on fire yourself, do not run for help, but lie down flat, and roll over and over on the ground or floor to smother out the flames.

Sunstroke.—When overcome by the heat, or suffering from a sunstroke, a person should lie down in a cool, shady place. The face and hands should be sponged with cold water. As soon as possible the patient should be taken to a cool room, and placed on a bed, with his head high. Cold cloths or, better still, the ice-bag, should be applied to the head, back of the neck, and spine, and warmth to the legs and feet. A drink of hot coffee or tea, or beef extract, will stimulate the weakened heart.

Broken Bones.—There is no urgent need of treating a broken limb before the surgeon arrives. If it is necessary to move the patient, he should be carried on a board or door, to prevent the broken limb from being moved before the doctor comes.

Frost Bite.—Rub the frozen parts with snow immediately or apply very cold water. When they begin to sting and burn, cease the rubbing. Ordinary coal oil also is an excellent application for frost bite. Treatment should always take place in a cold room before the frozen parts have become warm. The person should then become warm gradually.

Learn to Swim.—Every child should be taught to swim and to float. Besides being an excellent exercise in and of itself, swimming may be of service in saving the lives of others. A cool-headed, expert swimmer may save a boat-load of people.

XLVIII.—A PICTURE LESSON.

Write a story about the children in this picture. Tell how a cut should be bandaged.

F. DVORAK.

FIRST AID TO THE INJURED.

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